Prepared for
U.S. Agency for International Development
Health Insurance Organization, Egypt

Contract number:
263-0170-C-00-3042-00

FINAL REPORT FOR THE HIO MIS PROJECT

For project status as of June 20, 1999 (contract end date)

USAID Project Number: 263-0170

Prepared by:
The MAXIMUS, Chemonics, Arabsoft Project Team

Date:
July 30, 1999

July 30, 1999

Carl Abdou Rahmaan or Project Officer
Office of Health
USAID/Cairo
Zahraa El Maadi, Maadi
Cairo, Egypt

Dear Mr. Abdou Rahmaan/Project Officer:

MAXIMUS is pleased to submit the Final Report for the HIO MIS project. The contract ended on June 20, 1999. It has been our pleasure to serve USAID and the HIO on this contract over the past six and a half years.

This Final Report reviews the methods followed and activities conducted during the course of the contract. The report shows the status of the various tasks of the project, as we knew it, when we turned these activities over to HIO staff. Perhaps of more importance, however, we have tried to capture in this report some of the lessons learned during this project. The HIO project was a massive undertaking – to introduce a high level of automation across a very large and geographically disperse organization. The project has attained its goals, and the HIO is now managing the resulting MIS on its own. This report reviews the approaches used throughout the project in the hopes that future projects can learn from these approaches.

Again, it has been our pleasure to work on this contract. We continue to keep in touch with the HIO MIS Center, and hope that we can work together again in the future.

Sincerely,

Leslie Graham
Vice President

LG/ms

July 30, 1999

Dr. Hassan Abdel Fattah
Chairman
Health Insurance Organization
Heliopolis, Cairo
Egypt

Dear Dr. Abdel Fattah:

MAXIMUS is pleased to submit the Final Report for the HIO MIS project. The contract ended on June 20, 1999. It has been our pleasure to serve the HIO over the past six and a half years.

This Final Report reviews the methods followed and activities conducted during the course of the contract. The report shows the status of the various tasks of the project, as we knew it, when we turned these activities over to HIO staff. Perhaps of more importance, however, we have tried to capture in this report some of the lessons learned during this project. The HIO project was a massive undertaking – to introduce a high level of automation across a very large and geographically disperse organization. The project has attained its goals, and the HIO is now managing the resulting MIS on its own. This report reviews the approaches used throughout the project in the hopes that future projects can learn from these approaches.

Again, it has been our pleasure to work with you. We continue to keep in touch with the HIO MIS Center, and hope that we can work together again in the future.

Sincerely,

Leslie Graham
Vice President

LS/ms

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FINAL REPORT

1. OVERVIEW OF THE PROJECT

This document serves to summarize and bring to a close the work performed by the MAXIMUS, Chemonics and Arabsoft project team under USAID Contract Number 263-C-00-93-00042-00. This contract was to develop an updated Management Information System (MIS) for the Egyptian Health Insurance Organization (HIO). The concept expressed in the RFP was that work done under a previous USAID project, Urban Health in Alexandria, could be updated to form a new management information system for the HIO. Although the work done previously in Alexandria was invaluable as a learning experience, the technology and system designs were not sufficient for updating. There were two exceptions to this: 1) the automated Alexandria pharmacy software was robust and provided a good starting point for future development, and 2) the cost accounting system, though never automated, had been implemented in a manual fashion that was well designed for automation under the current project. In addition, the Alexandria MIS staff had over ten years experience in running a MIS within the HIO. This experience and the lessons learned by that group contributed to the planning process for the current project.

1.1 SCOPE OF WORK CHANGES

The RFP for this contract was released in mid 1991. MAXIMUS submitted our proposal in July 1991. A Best and Final Offer (BAFO) was requested and submitted in May 1992. Another BAFO was requested and MAXIMUS made a second BAFO submission in December 1992. The above referenced contract with MAXIMUS was signed in January 1993, approximately eighteen months after initial proposal submission. By May 1994 it was clear that the contract needed to be amended to bring it more in line with the current needs of the HIO. Negotiations for an amendment ensued, with a major amendment (modification #2) being signed in September 1995. The primary modifications to the scope of work were:

- o modification and clarification of the software modules to be developed,
- o further definition to the hardware procurement specifications,
- o clarification of deliverables, and
- o specification of site counts to be implemented.

This last issue – the exact sites – continued to change throughout the contract period. Sites were added and deleted on a continuing basis. In some cases sites were under renovation or construction and could not be implemented. USAID, HIO and MAXIMUS were party to all decisions regarding the specific sites to be implemented.

In January 1996 the two-year option on the contract was exercised by USAID, bringing the contract end date to January 1998. The overall scope of work, staffing and daily project operation were simply extended by the exercising of this option; software module development and implementation continued as it had during the initial three-year period. Towards the end of 1998, the contractor was directed to complete, install and provide the requisite training for the HIO branch applications for data conversion in the four branch facilities of North Upper Egypt, Middle Upper Egypt, South Upper Egypt and Mid-Delta. These were four additional branch facilities over and above the previous scope of work. The contract end date was extended to June 20, 1998 to accommodate this change; LOE and budget modifications were also done. By May 1998 many daily MIS activities were fully in the control of the HIO MIS Center staff. However, there remained the need for some limited technical assistance. The contract end date was further extended to January 20, 1999. The scope of work under this extension period was as follows:

o   provide continuing limited technical assistance, with specific emphasis on strengthening the problem-solving capabilities and responsiveness of the Help Desk and Technical Support Group functions of the HIO MIS Center and the branch headquarters;

o   design a system for a distributed beneficiary registration application which will better allow the MIS to accommodate new groups of beneficiaries as they are identified and added to the system (this was produced as deliverable #32);

o   enhance HIO management demand for data for decision making; and

o   analyze and address potential "Year 2000" issues that may arise for both hardware and software.

The staffing levels under this extension period were significantly less than the previous contract periods, with one full-time technical expatriate, one full time expatriate administrator and a number of local technical and support staff. This was supplemented by short-term technical assistance as needed.

The contract was due to end on January 20, 1999; all project files had been shipped and expatriate HHE's packed. On January 21, 1999 the USAID Project Officer requested MAXIMUS to utilize the very limited remaining LOE and budget to provide some additional short-term technical assistance to the HIO. A no-cost extension moved the contract end date to June 20, 1999.

1.2 CONTRACT PRICE AND LEVEL OF EFFORT CHANGES

The contract was initially let as a three-year contract with a two-year option period. This five-year contract was ultimately extended by another 12 months, bringing the contract completion date from January 20, 1998 to January 20, 1999. As mentioned above, a no-cost extension was requested by USAID to utilize remaining funds and LOE. The no-cost extension ran through June 20, 1999 although LOE and funding was used by May 1999.

This contract was a Level of Effort (LOE) contract. The initial contract required 1,892 person months of LOE. The extension of the contract from a five-year contract to a six-year contract, with the additional scope of work, brought the total contracted LOE to 2,094 person months. This represented an 11 percent increase in LOE, although the total contract time increased by 20 percent. This difference is accounted for because the scope of work during the last extension phase (June 1998 – January 1999) was quite limited, as was discussed in Section 1.1.

In moving from a five-year contract to a six-year contract, with the additional LOE, the contract price went from $21,084,122 to $23,457,925. This represents an 11 percent increase in contract price in keeping with the LOE added for the sixth year.

2. METHODS

This section discusses the methods and approach used by the MAXIMUS team in bringing the HIO MIS project to a point of success. It is hoped that by describing these approaches, future USAID technology projects can make use of these methods as fit their requirements.

2.1 PROJECT ORGANIZATIONAL STRUCTURE: ONE GOAL, ONE TEAM

From the beginning the MAXIMUS project team has approached this project as technical assistance in the best sense of those words. The aim was to work side-by-side with the HIO MIS Center staff, building their skills and instilling a work style appropriate for a major information systems center.

When MAXIMUS began the contract, the HIO had no real MIS department. A group of twenty-three people had been provided, through another USAID contractor, limited PC based computer classes. This group had a Director who served as the project liaison, but the staff was spread throughout HIO Cairo facilities due to a lack of office space. Beyond having a Director, there was no other organizational structure.

As soon as office space could be arranged (around the eighth month of the project), contractor and HIO MIS Center staff were co-located. The project organizational chart was set up to mirror that of a major information systems center. As is shown in *Exhibit 2-1: Project Organization Chart*, the Chief of Party and the HIO MIS Center Director worked together to lead the combined staff.

Exhibit 2-1
PROJECT ORGANIZATION CHART

```
                    ┌──────────────┬──────────────┐
              ┌─────────────┐  ┌─────────────┐
              │  DIrector   │  │Chief of Party│
              │ HIO MIS Center│ │   MAXIMUS   │
              └─────────────┘  └─────────────┘
                    ┌─────────────┬──────────────┐
              ┌─────────────┐  ┌─────────────┐
              │Administration│ │Administration│
              │HIO MIS Center│ │ Project Team │
              └─────────────┘  └─────────────┘
   ┌───────────┬───────────┬─────────┬───────────┬──────────┐
┌──────────┐┌─────────┐┌─────────┐┌────────────┐┌─────────┐
│Implementation││Operations││ Training ││Applications ││ Support │
│   Team    ││  Team   ││  Group  ││Development  ││Help Desk│
│           ││         ││         ││   Team     ││         │
└──────────┘└─────────┘└─────────┘└────────────┘└─────────┘
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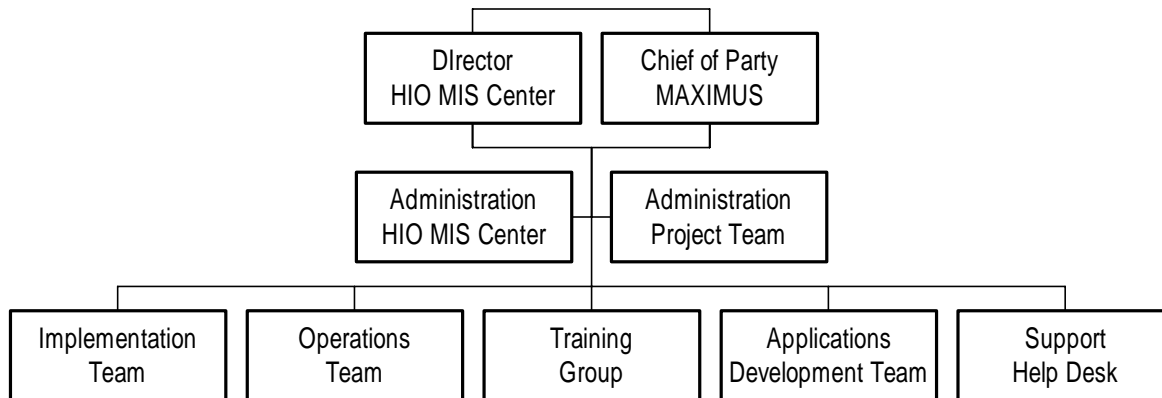
In this way, the HIO staff was working within what would be their ongoing structure right from the start. Although the HIO staff was only just developing their technical skills, all staff– both HIO and contractor – were given meaningful roles within the overall MIS organization. For example, HIO staff designated as developers (programmers, analysts and database administrators) was assigned to specific software application modules. Early on, this staff was paired with contractor staff to participate in the analysis and development of system design documents. HIO operations staff was assigned to specific shifts and relied upon to keep the computer systems up and running during those hours. As technical skills improved, additional responsibility was given to the HIO staff.

For each of the team/group areas, an HIO staff member shadowed the manager from the MAXIMUS team. The aim was to develop not only a MIS Center with technical capacity, but also the management structure to keep the MIS Center in place and functioning well after the MAXIMUS contract was completed. In addition, it was recognized that the MIS touched all facilities of the HIO. It did not exist in a vacuum at the central MIS Center.

A complete MIS organizational structure and staffing plan was developed for the HIO polyclinics, hospitals, branches, headquarters and central MIS Center. This plan was developed in 1995 and published as Deliverable #20, **Recommended Organizational Structure for Information Systems within the Health Insurance Organization**, on February 18, 1996. The plan included a phased approach that took into account the HIO MIS Center's ability to absorb new staff with no previous systems experience while more senior staff was still developing their skills. The phased approach also detailed the steps for transition of responsibilities from contractor to HIO staff. Having this document at the midpoint of the project was very useful. With the previous three years of learning behind it, the document could account for specifics within the HIO. Having three years left on the project after the creation of this document gave time for its acceptance and implementation.

2.2 SOFTWARE DEVELOPMENT METHODS

The MAXIMUS team followed the most accepted methods of software development. Each software module began with a functional design process. The functional design process proceeded as follows:

o   review of the overall HIO organization to see which departments, facilities and processes would be touched by the software module;

o   interviews with the various staff and managers, across a range of facilities;

o   collection of written and unwritten procedures, codes, rules and other elements in use in the current manual process;

o   development of a design showing the high level functions of the software applications and basic data flow;

o   documentation of the organizational and operational assumptions that went into the design;

o   multiple meetings to review the assumptions and draft designs; and

o   production of a functional design document for final review and approval.

Once the Functional Design Document is completed, the Detailed Design Document is begun. A detailed design is intended to convey specific programming information from the analysts performing the functional design to the programmers who will create the applications software. The Detailed Design Document contains the menu structure, screen layouts, report layouts, database designs, program specifications and manual contingency plans (recognizing the system will occasionally be down.)

Using the Detailed Design Document, programmers create the software application, develop a Test Plan, and perform unit, integrated and on-site beta testing. When the applications software is ready for release, the completed program is documented in the System Document. This document follows the same format as the Detailed Design. **Functional Design Documents**, **Detailed Design Documents**, **Test Plans**, and **System Documentation** for each module can be found as Deliverables 5, 6, 9, and 10 respectively.

The MIS developed for the HIO consists of eleven software modules. Most of these modules are developed to operate at the various organizational levels of the HIO. These levels are:

o   Headquarters Facility (1),
o   Branch Facilities (8), and
o   Polyclinic, Hospital and Store Facilities (74).
Exhibit 2-2: Implemented Modules, illustrates the modules implemented at the various organizational levels. Note that the Management Reporting and Medical Quality Assurance

modules, scheduled in the contract for implementation at two site categories, were expanded by MAXIMUS to include all four primary site categories for increased management involvement.

The modules, as tailored to the organizational or site level, are called applications. In all there are therefore thirty applications being developed as a part of the HIO MIS. In addition, the HIO staff has taken on the development of other modules not called for under the MAXIMUS contract. These modules include Laboratory Results Reporting and General Ledger. The HIO has also programmed a help desk module designed by MAXIMUS.

Perhaps the most fundamental question when automating an existing organization is how much of the current process to automate and how much should be changed. In some ways this is equivalent to the "build or buy" question. When one buys a software package, the package imposes a preconcieved mode of operations and the organization must conform. When building a software package, the package can be made to conform exactly to existing operations. There are, of course, pros and cons to both approaches. Building software allows for a great amount of flexibility and control, however it also tends to lead to the automation and further institutionalization of existing bad practices.

Exhibit 2-2
IMPLEMENTED MODULES

Application	Polyclinic	Hospital	Branch	Headquarters
Beneficiary Registration	X	X	X	X
Eligibility Verification	X	X	X	X
Patient Medical Records	X	X		
Drug Control/Pharmacy	X	X	X	X
Cost Accounting	X	X	X	X
Admission Discharge Transfer		X		
Contracted Pharmacy			X	
Medical Quality Assurance	X	X		
Management Module			X	X
Periodic Medical Exam			X	
Contracted Providers			X	
Computer Operating System	X	X	X	X

The MAXIMUS team was concerned about its role as both technical assistants to a software development effort and as change agents within the HIO as a whole. The HIO is a large and bureaucratic organization which has limited capacity for integrating change into its operations. As one HIO Chairman once said "I am a head with no attachment to my arms and

my legs." Partially due to the lack of other information systems, few communication and feedback loops were in place in order to implement any massive change.

Meeting this challenge to automate an organization with limited capacity for change was a formidable task; one which had both its successsful and less successful ends. Throughout the design process, MAXIMUS would recommend changes to existing operations/procedures. In some instances the changes were readily accepted by the HIO. Some of these accepted changes were made and others - long after the system had been designed and implemented – still remain to be implemented. In other instances, the HIO stated that it could not make that change and yet no other way could be found to make the software function most effectively without a change. An example of this is for the contracted pharmacy module. MAXIMUS recommended a new staffing pattern which integrated pharmacists and accountants into teams. MAXIMUS workflow studies showed this was the most effective way to create efficiencies with the contracted pharmacy module. However, HIO could not find a way to alter the grade levels of these staff such that they could work together in shared teams. Less optimal uses of the module had to be implemented.

In many cases existing operations not at peak efficiency had to be left in that state, and the gain of automation was in the data being gathered for later management and clinical purposes. This is a common trade-off decision, especially when automating organizations which have never before been through an automation process.

In terms of lessons learned when designing future techology implementation projects, the following experiences of the MAXIMUS team may be of assistance.

o **Look Carefully at the Number of Modules to Be Developed:** Under this contract, what appeared to be 11 modules at the outset were really 30 separate and distinct applications. The shear workload involved in completing the design and programming of this number of modules leaves less time for implementation and organizational change.

o **Concentrate Automation Efforts Where They Will Be Best Accepted:** Analyze the areas of the organization which can most readily change and concentrate automation in those areas at first.

o **Expect Automation of Previously Unautomated Organizations to Be An Iterative Process:** As automation is introduced and integrated into the organization, additional feedback loops and communication methods become available which in turn allow for more challenging software to be introduced (in terms of change demanded).

o **Plan For The Natural Resistance To Hard Data:** As hard data shows deficiencies it is natural for people to blame the messenger (the computer system is bad, the data are wrong, the programs operate incorrectly, and so on) An internal and external public relations campaign should be included as a part of the introduction of extensive automation in previously unautomated organizations.

These lessons can be useful to future automation project. As the next section describes, despite some organizational resistance, the MIS has been successfully installed at the HIO sites and is used daily by hundreds of HIO staff. The data being collected will prove invaluable to the HIO in the future.

3. COMPLETION STATUS

To follow the path of progress during the course of this contract, it is best to review Quarterly Progress Reports No. 1 – 23. These QPRs detail the activities and accomplishments of each quarter of the project, show progressive administrative information about LOE and budget expenditures, and provide a running description of open issues throughout the life of the project. Since this document also serves to cover the status during the final quarters of the project, the following sections provide a status update for the main contract tasks as of project close.

3.1 PHYSICAL SITE PREPARATION

Physical site preparation consists of the following steps:

o locating, with HIO approval, a suitable computer room in each site;
o developing renovation plans for the computer room (and for increased shelf/ledge space in beneficiary registration areas where necessary – an added effort once it became clear many sites did not have the shelf area to accommodate terminals and keyboards. The HIO was responsible for buying furniture, but beneficiary registration areas typically already had built in ledges at the service counters, with no room for added furniture);
o development of the Terms of Reference, gathering of bids and award to a renovation contractor;
o supervision of renovation;
o layout designs for hardware and cable installation;
o installation of cable and cable trays;
o supervision of hardware delivery and installation;
o touch up after delivery; and
o addition of equipment to site inventory.

Exhibit 3-1: Site Preparation and Implementation Status by Site, shows the completion status for all sites (as of January 20, 1999, the last day the site preparation coordinator was on staff). Note that in some cases sites were started on the preparation process (funds expended),

Exhibit 3-1 (Page 1 of 4)
SITE PREPARATION AND IMPLEMENTATION STATUS BY SITE

Exhibit 3-1 (Page 2 of 4)
SITE PREPARATION AND IMPLEMENTATION STATUS BY SITE

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Exhibit 3-1 (Page 3 of 4)
SITE PREPARATION AND IMPLEMENTATION STATUS BY SITE

Exhibit 3-1 (Page 4 of 4)
SITE PREPARATION AND IMPLEMENTATION STATUS BY SITE

8954-C

but were cancelled or put on hold for some reason. In most cases the site was taken out of service by the HIO for renovation. Starting in 1997, the project provided dates to the HIO by which these sites would need to be back in service if project-sponsored preparations were to be completed before project close. As can be seen in the charts, some sites remain inactive. However, all sites that were available and active have had all phases of site preparation completed.

3.2 SOFTWARE MODULE DEVELOPMENT

Activities under the software module development task include the following for each module:

- o   functional design,
- o   detailed design,
- o   code/test,
- o   system documentation,
- o   user documentation, and
- o   beta test.

Exhibit 3-2: Status of Applications, details each of the software applications and its status. As can be seen, all applications are completed for all phases. The sole exception to this is the drug stores application. This application was undergoing beta test at the NWDB drug store.

Most modules have been completed and operating since 1997. As is common with Oracle-based systems, performance issues came to the fore once the software modules were under daily use. Performance issues for the HIO were mainly the speed of data retrieval and report production. Much effort during 1997 and 1998 was focused on performance tuning. Most applications code was tuned by the close of 1997 and attention turned to Oracle itself. A major bug was found in the relational database (Oracle) which was causing performance problems. The fix to this bug requires upgrading all HIO sites to Oracle Release 7.3.3. Fortunately, this is also the release to which the HIO must upgrade in order to have Oracle be Year 2000 compliant. A standard Oracle upgrade tape was developed and tested and HIO operations staff was taught the procedures for performing the upgrade. When the contractor's last full-time technical assistant was demobilized in January 1999, the HIO had completed approximately fifteen percent of these upgrades. With the final short term trip of this technical assistant, ending April 30, 1999, the HIO had completed 40 percent of these upgrades.

[Also for Year 2000 compliance the underlying UNIX operating system must be upgraded. The HIO has previously done one upgrade of UNIX to all sites. Therefore the HIO operations staff are well versed in how to proceed. At the time the contractor's last expatriate technical assistant was demobilized, the HIO operations staff were still concentrating on completion of the Oracle upgrade and could not yet start the UNIX upgrade.]

Exhibit 3-2
STATUS OF APPLICATIONS
(As of January 20, 1999)

Application	Functional Design	Detailed Design	Code & Test	System Doc's	User Doc's	Beta Test	Training Material
Beneficiary Registration/Eligibility Check (Clinic)	C	C	C	C	C	C	C
Beneficiary Registration/Eligibility Check (Branch)	C	C	C	C	C	C	C
Beneficiary Registration/Eligibility Check (HQ)	C	C	C	C	C	C	C
Drug Control (Clinic)	C	C	C	C	C	C	C
Drug Control (Store)	C	C	C	C	C	IP	C
Drug Control (Branch)	C	C	C	C	C	C	C
Drug Control (Hospital)	C	C	C	C	C	C	C
Drug Control (HQ)	C	C	C	C	C	C	C
Visit Tracking/Patient Records (Clinic)	C	C	C	C	C	C	C
Visit Tracking/Patient Records (Hospital)	C	C	C	C	C	C	C
Cost Accounting (Clinic)	C	C	C	C	C	C	C
Cost Accounting (Hospital)	C	C	C	C	C	C	C
Cost Accounting (Branch)	C	C	C	C	C	C	C
Cost Accounting (HQ)	C	C	C	C	C	C	C
Contracted Pharmacy (Branch)	C	C	C	C	C	C	C
Computer Operator System (Facility)	C	C	C	C	C	C	C
PME (Branch)	C	C	C	C	C	C	C
A/D/T (Hospital)	C	C	C	C	C	C	C
Medical Quality Assurance	C	C	C	C	C	C	C
Management Reporting	C	C	C	C	C	C	C
Contracted Providers (Branch)	C	C	C	C	C	C	C
Financial Feasibility Study	C	N/A	N/A	N/A	N/A	N/A	N/A

C = Completed   N/A = Not Applicable IP = In Progress

The configuration of hard drives and memory within the HIO servers was studied for further performance enhancement. The HIO servers had 32MB of RAM with multiple hard drives, usually in .5 or 1 GB increments. Concerns over the amount of RAM had been raised. After more than nine months of study, it was shown that 32 MB of RAM was sufficient for the HIO MIS, and performance gains equivalent to increasing the RAM could be gained by reconfiguring partitions across the hard disks. To meet concerns, however, the project ordered and provided to the HIO both memory upgrades (to 64 MB) and additional hard drives to implement the optimal hard disk configuration. These hard drives and memory will need to be installed by HIO operations staff.

3.3 HARDWARE PROCUREMENT

Hardware procured under this contract has been documented in Appendix C of each Quarterly Progress Report. In addition, the project maintained a complete inventory, by site, of each piece of equipment. By close of project, this inventory had been turned over to and signed for by the HIO. This was done in a gradual process over the course of two years. It is important that the HIO continue to maintain a site-specific inventory. The contractor observed that equipment had a tendency to be moved without notification to the inventory control officer. Without a tight control over the whereabouts of inventory, management of hardware maintenance becomes difficult. In April 1999, MAXIMUS called on our site preparation coordinator to assist the HIO in completing inventory changes. It is hoped the HIO can continue this practice without further assistance.

In terms of hardware maintenance, the MAXIMUS, Chemonics, Arabsoft project team maintained a general maintenance contract with NCR until July of 1998, at which time responsibility for hardware maintenance was turned over to the HIO. (Originally hardware maintenance was to be turned over to the HIO in January 1998, but the HIO requested a six-month extension that was approved by USAID during contract modification 8.) The contractor worked together with the HIO and NCR to develop a suitable maintenance contract vehicle for use by the HIO. Although the contract vehicle itself was developed, the HIO did not fund this. **As of July 1998, the HIO was performing hardware maintenance itself. The contractor does not recommend that this continue**. It is our understanding the HIO will agree to fund a hardware maintenance contract in the near future.

3.4 SITE TESTING/SOFTWARE SIGN-OFF (ACCEPTANCE)

With the exception of the Medical Quality Assurance, Management Reporting and Store modules, all software has been completed and fully site tested since 1997 (or earlier in many cases). Many of the earlier modules were reviewed by outside consultants hired by HIO under PIL funds. HIO consultants, when available, were included throughout the software development lifecycle in order to ensure their thorough understanding and review. Medical Quality Assurance, and Management Reporting completed their site testing in 1998. USAID has been provided all relevant material for all modules, and a USAID representative has reviewed the software modules on-site.

3.5 TRAINING

The methodology used for training under this contract was one of train the trainer (TOT). At the central MIS Center, MAXIMUS contractor staff and HIO MIS staff worked together as part of the central training team. MIS Center training staff was taught to develop training materials and curricula, teach courses, and manage training programs. As MIS Center staff gained skills and confidence, they were provided additional responsibilities – under the continued management of the MAXIMUS training coordinator. As MIS Center training staff became proficient at leading training courses and managing training programs, they assisted in the training of HIO Branch level training staff in these skills. **The MIS Center training staff took over all training responsibilities under the project as of May 1998.**

All end-user training under this project was competency-based. The goal was to have trainees achieve competency before leaving the classroom. The project developed a complete Training Follow-Up program. This allows the HIO to continually monitor the skills of the MIS end-users and provide retraining when necessary. The first round of follow-up testing was conducted between October and December 1997. Results were reported in Deliverable #22, **Training Evaluation Report**. A second round of follow-up testing was carried out in the summer of 1998. Results of this second round were reported at the MIS Workshop held November 25, 1998. Refer to the document entitled **Workshop on HIO MIS Training Intervention Planning**, dated November 30, 1998 for details.

All training took place in Egypt. Most training of MIS end-users took place at the MIS training centers prepared under this contract and located at the HIO branches. With the exception of a few specific technical courses, project personnel (HIO and contractor staff) provided training. MIS technicians (as differentiated from end-users) received some specific technical training from outside vendors (NCR and Oracle). In addition, over the course of the contract, eight large MIS workshops specifically for HIO managers were conducted off-site at hotels in Egypt.

3.5.1 Training Categories

There are three types of individuals who received training under this contract: applications end-users, MIS technicians, and HIO managers. From January 1993 through December 1998, the project provided MIS training to 2,532 HIO employees. In total, 38,283 person-days of training were delivered to these 2,532 individuals. *Exhibit 3-3: Total Number of HIO Employees and Total Number of Person-Days of MIS Training Completed by HIO Personnel by Category of Training*, shows the breakout of these individuals by category.

Exhibit 3-3
TOTAL NUMBER OF HIO EMPLOYEES AND
TOTAL NUMBER OF PERSON-DAYS OF MIS TRAINING
COMPLETED BY HIO PERSONNEL BY CATEGORY OF TRAINING

Category of HIO Trainee	Total Number of HIO Individual Employees who Received MIS Training Provided by the Project	Total Number of Person-Days of MIS Training Delivered by the Project (Jan 1993-Dec 1998)
MIS Application End Users	2,058	19,062
MIS HQ, Branch, and Facility Technicians	355	14,844
MIS Management Users	119	4,377
Total of All Categories	2,532 HIO Employees Trained for the MIS	38,283 Person-Days of MIS Training

3.5.1.1 Application End Users

The HIO MIS was designed as an operations-oriented system. It is a part of the HIO departments in which it was placed - a tool for daily departmental activities. All data in the system are captured at source, for individual HIO patients. All necessary aggregate information can be formed from the disaggregated information collected on individual patients.

Therefore, the Application End User is **the** most important person. The application end user is the person who uses the system daily, records the incoming data and utilizes the operational reports. Without the full support of the Applications End Users, the system does not function.

Most HIO employees trained as applications end users were selected from the functional area and the site in which they were already working. In other words, end users trained as beneficiary registration clerks had been beneficiary registration clerks under the manual HIO operations.

All end users of each application received five days of formal competency-based classroom training on the application for which they were being prepared to use. The project scheduled MIS Applications End User Training within two weeks of the time the trainee was scheduled to go live at his/her site. Once at work, the MIS application end users were given short-term (generally three weeks) intensive on the job support and then launched on their own.

Periodic training follow-ups are conducted to determine when refresher courses are needed. This follow-up methodology was discussed above. **NOTE: Training follow-up found that it was not uncommon for staff trained on the MIS to be moved by HIO managers to other, non-MIS, jobs within six months after their training. This creates an ongoing**

training burden for the HIO. Consideration of training received should become a part of staff transfer decisions.

3.5.1.2 MIS Technicians

To develop, operate and maintain a countrywide MIS required a core of well-trained MIS technicians. Prior to the project, the HIO had almost no computerization and no staff with computer skills. A small cadre of twenty-three individuals had received some basic PC-level technical training through another USAID contract. Hence, technician training was a major priority from project inception.

The HIO selected employees it wished to be considered for technical MIS training and then submitted names of candidates to the contractor. These individuals were tested for basic computer aptitude (logic) using a standardized and validated testing instrument. Nominees for central MIS Center or branch technical positions were also tested for basic English competency, as most computer vendor manuals are written in English.

NOTE: The contractor strongly urges other technical projects to utilize basic aptitude testing for the selection of technical candidates. A standard cut-off score allows fair treatment of all applicants regardless of personal connections. In addition, the use of a test shows candidates that this is a serious undertaking and therefore candidates who are not seriously interested in the positions self-select out.

The number of technical courses provided to HIO technician trainees at the HIO main MIS Center varied from five to twenty-two weeks of training, depending on the position the individual was expected to hold upon completion of formal MIS technical training. Branch technicians received seven or eight weeks of technical training and facility technicians at least one week. Additionally, all technicians received training on each of the MIS applications developed under this contract. All technicians received on the job training from their project counterpart(s).

3.5.1.3 HIO Managers

Three types of MIS management training were provided by the project.

o **Management Orientations When a New MIS Application Was Introduced To a Site:** As with most managers, HIO facility managers want to remain in control of the activities at their sites. MIS orientations were focused on developing facility managers'understanding of what was being introduced to their sites, the impact it would have on personnel and process, the benefits, and the potential obstacles to success. These orientations provided an opportunity for managers to ask questions and become knowledgeable about the MIS. MIS management orientations were either one or two days, depending on the curricula.

o **MIS Management User Application Training for Every Application Running at the Site:** Each facility manager was provided a hands-on training for all applications

running in his/her facility. In this way, the manager could firmly understand the applications and the type of work his/her employees were performing using the system. In addition, these trainings focused on the types of data being collected in their facility by the computer system. This was a very important focus for the following reasons:

.   a manager who understands the data being collected can work to ensure it is collected accurately,

.   a manager who understands the data going in to the system has a better understanding of the data coming out of the system (reports), and

.   a manager who understands the data inputs and outputs to the computer system then has the knowledge necessary to think creatively and request additional analyses and ad-hoc reports from the system.

MIS Management User Applications Training was five days for facilities and four to eight days for MIS Management Users of branch applications, depending on the number of applications running at a branch.

o   **Branch-wide Management Orientation Workshops on the Management and Medical Quality Assurance Modules:** The end-user applications (drug control, beneficiary registration, medical records, and so on) are essential to collecting a wide base of useful management data, and also serve to enhance efficiency and quality of daily facility operations. There are many reports within the end-user operational applications that are of critical daily importance to facility managers. For example, daily census in the hospital or visits by specialty at a polyclinics. All these operational reports can assist the facility manager in enhancing his/her facility. However, once these reports become a part of a manager's daily repertoire, the next step is to begin using the Management and Medical Quality Assurance modules to make longer-term, more strategic decisions. These workshops provided facility managers with specific training on the reports available within the Management and Medical Quality Assurance modules, and with training on the analytic process involved in making longer-term decisions based upon available reports.

In addition to the above training, which is specific to the data and reports available through the HIO MIS, both the HIO and the contractor recognized that HIO management is weak in general management skills. Through PIL funds, the HIO organized a number of training sessions on basic statistical and management methods (goals setting, planning, Management By Objective, and so on) The contractor provided level of effort to assist the HIO in building and outfitting two management training centers; one at El Nil Hospital in Shoubra and one at Abu Qir near Alexandria. The contractor worked with the HIO reengineering coordinator to design appropriate management trainings that should be offered through these centers.

3.5.2 Training Curricula

With the exception of the curricula for NCR and Oracle courses, the project team created all curricula used in the HIO MIS training. All MIS application user (both end user and management user) curricula were developed in Arabic. Overall the project team created curricula for 11 different course or workshop types; within these 11 unique materials were developed for a total of 107 different training courses. *Exhibit 3-4: Project Created Curricula*, details these courses.

Since January 1997 all MIS training workshops have been video taped, as have some of the Help desk and Training-of-Trainers (TOT) classes. MIS Management User Training for Polyclinic Managers was also videotaped. These videotapes can be used by the HIO for refresher training or review of project sponsored training activities.

Exhibit 3-4
PROJECT CREATED CURRICULA

Course /Workshop Type	Number of Individual Courses Developed of This Type
Help Desk Orientations and Training Classes	10
End User Applications Training Classes	26
MIS Management User Applications Training Classes	26
ICD-9 Coding Training	1
MIS Applications Orientation Workshops	23
Training of Trainers (TOT) for HIO MIS Training Staff	4
Team Building Workshops	6
HIO MIS Branch-wide Workshops	4
Management Training Workshops for HIO MIS Computers Centers	5
MIS Training Follow-up Refresher Workshop	1
MIS Training Intervention Planning Workshop	1

3.5.3 International Code for Disease (ICD)-9 and Common Procedures Terminology (CPT) Coding

Training for physicians and nurses in Egyptian medical schools does not include the standard ICD-9 and CPT-4 codes to describe diagnoses and procedures respectively. MAXIMUS has repeatedly worked with the HIO to develop ICD trainings, and has developed specialty specific hand-outs for ICD-9 codes. However, the HIO has not implemented this training on a wide scale, and the percent accuracy of coding by the physicians remains low. The HIO has developed its own common procedure terminology, but again has not implemented any wide-scale training.

Entry of all required data for all beneficiaries together with consistent and correct use of these codes is the only way the HIO and its consultants can study management and quality assurance data collected by the system. **Training on the use of ICD-9 and procedure codes must be provided in the future for new physicians and nurses as they become HIO providers.**

3.6 HELP DESK

Throughout the project, technical support has been recognized as a vital function of the HIO MIS Center. In response to this need, a Help Desk department has been organized to respond to all support requests of system users. As the system continued to evolve and grow, so did the responsibilities of the Help Desk. In response to this heightened need for a department capable of sustaining the system, the project embarked upon a reform effort of focused improvements. The reform process was executed by short-term contractor staff, and contained the following steps:

- o   off site research and preparation,
- o   on site analysis of operations,
- o   identification of critical success factors,
- o   resolution of critical success factors,
- o   conducting help desk conferences,
- o   implementing a Help Desk Team Charter, and
- o   continued performance evaluation and management.

Combining the off site research and preparation with on site analysis of operations, a list of critical success factors was identified for focused reform efforts. The following are examples of some of these critical success factors, as well as some activities that were used in addressing them.

- o   **Understanding of a Help Desk's Functions:** Upon interviewing Help Desk Staff at the MIS Center, it was learned that most were not aware of how a Help Desk is supposed to operate. Much of this was due to Help Desk being a relatively new concept in Egypt. They did not know that a Help Desk should receive a *prepared* problem request from a user, *negotiate* with the user, *assign* a particular priority to the problem, *perform the resolution* of the problem following the guidelines set by

the priority level, *report the completion* of the resolution, and *ensure the acceptance* of the user.

Help Desk staff was subsequently educated as to the primary responsibilities of a Help Desk. They were taught the importance of assigning priorities to problem requests and the importance of ownership of problems in their resolution. They were also taught their responsibility for educating users in the operation the system, and for continual interaction with other Help Desk members, such as branch Help Desk.

o **Skill Levels:** HIO Help Desk uses the Frontline/Backline model. The group responsible for fielding problems and solving less complicated problems – the Frontline or Branch – passes any unresolved problems on to a more capable group with additional resources – the Backline, or MIS Center. Therefore, the MIS Center Help Desk must be more capable than the Branches in responding to support requests.

On site analysis showed that the gap between the experience and competence of MIS Center Help Desk and the branches was not wide enough to support the Frontline/Backline model. More justification for utilizing a Help Desk in MIS Center was needed, other than the fact that they were close to Departments, and therefore could easily pass problems on to departments.

To address this problem, MIS Center Help Desk Staff received additional training for increasing competency. Also, personal training was given by short term technical assistance staff in the diagnosing of actual problems. The analytical process of determining potential solutions to technical problems was also addressed. As a result, Branch Help Desk staff now know there is a MIS Center Help Desk capable of resolving problems which they cannot handle themselves.

o **Controlling Backlog:** Immediately, it was learned that Help Desk could not perform day-to-day work – such as adequately responding to emergency problems - due to the shear volume of unresolved problems which had them weighed down. In mid-1997, there were over one hundred thirty problems in backlog, some that were over a year old. Thus, the first step was to take all pending problems, prioritize them, assign them to different staff members, and solve them to the best of their ability. After that, Help Desk was taught the importance of monitoring the backlog, and maintaining it at a manageable level. As of January 1999, problem backlog ranges from about twenty to thirty five problems, and holds steady.

o **Priority Setting and Management of Enhancement Requests:** Typically, a Help Desk has four ways in which to classify a problem by priority. These are: 1) emergency, 2) urgent, 3) regular, and 4) enhancement. Priority assignment determines the length of allowable time to solve a problem. Analysis showed that every problem entering HIO Help Desk at any level was tagged as urgent. Subsequently, Help Desk was trained on the importance of priority setting, and specific timeframes were assigned for the resolution of these different priority levels.

In practicing the diagnosis of actual problems, a great deal of attention was given to the assignment of priorities.

o   **Policies and Procedures:** No documentation was available for use as a reference for Help Desk staff. Guidelines of Help Desk operations had been formulated in project deliverable #23, but most were not strictly enforced, or even known in some cases. Therefore, a Help Desk Team Charter was developed to define the mission and objectives of the HIO Help Desk, as well as set specific guidelines for Help Desk operations.

Other critical success factors that were identified and tackled were:

o   call flow models that define how problems pass through the entire HIO Help Desk,
o   interfaces with hardware vendors as a means for improving vendor response,
o   the role of the Help Desk in the configuration control of the system, and
o   performance measurement of the Help Desk.

Help Desk staff have become fluent in many different disciplines. Through hands-on training and experience, they have learned all aspects of hardware, software applications, and database administration. They can now solve almost any user request on their own, or at least are aware of who the best person to help them would be. Such resolutions are done in a timely fashion in order to keep data flowing and to sustain the system – a critical function as sustainability is the cornerstone of any endeavor.

As an example of Help Desk improvements the following table, *Exhibit 3-5: Help Desk Capabilities*, illustrates changes in the Help Desk due to the ongoing technical assistance that began in late 1997.

As the MIS continues to evolve under HIO management, *it is vital that the importance of the Help Desk in sustaining the system is not lost.* The HIO must understand that, as a result of its continual monitoring of the system and consistent contact with system users, *the Help Desk has the most far-reaching view of the day-to-day functioning of the MIS.*

3.7 DATA CONVERSION

The core of the HIO MIS is the database of beneficiaries and their eligibility status. This database contains a unique identifier for each beneficiary that is critical to the smooth operation of the HIO MIS, as it would be to any large scale MIS such as this. A unique identifier provides a code by which to look up a single individual. When an individual must be looked up by name, especially in Egypt, the search process is significantly slowed and multiple

Exhibit 3-5
HELP DESK CAPABILITIES

FROM	TO
Lack of ownership of problems	Single point accountability

Reduced levels of customer confidence	Guaranteed response and resolution time
Computer resource	Organizational resource
Research driven	Information management driven
Vague knowledge of products and services	Well-developed, well-rounded skill set
Long cycle times and inconsistent follow-through	Responsive with root cause resolution
Limited team communication	Shared responsibility – team decisions

individuals usually match the search criteria. This causes the computer user to have to visually scan the resulting list and manually select the correct individual. This is why every large-scale computer system uses a key identifier (such as SSN in the US) to speed searches.

From the beginning of this contract the beneficiary database has been a problem. The HIO gets all its beneficiary data from two sources – the Social Insurance Organization (SIO) and the Pension Insurance Organization (PIO). Employers pay a work tax to the SIO and pensioners/widows pay directly to the PIO for social services. A portion of the money from each organization is passed along to the HIO, which in turn provides health care to those SIO and PIO eligibles. The HIO does not control who is eligible, who has paid their premiums, or who is still employed with an eligible employer. All eligibility for HIO services comes second-hand through the SIO and PIO.

Because of this situation, USAID had intended to make data sharing between the HIO, PIO and SIO a condition precedent for this project. However, this was not done and the project has struggled with the consequences since. It took almost two years from contract signing to get a signed agreement between the Ministry of Health (for the HIO) and the Ministry of Social Affairs (for the PIO and SIO) stating that data could be shared. It was another year before either the SIO or the PIO produced data tapes without formatting errors. Even today, the accuracy of the data being received from the PIO is low.

The quality of the data contained within these data transfers affects the HIO both financially and operationally. Without accurate knowledge of who is eligible and who is not, the HIO has had to adopt a policy of offering service to anyone who presents the correct documentation. The level of fraud is high. Without accurate eligibility data from the SIO and the PIO, the HIO has no way to determine whether the amount of money being transferred from these organizations is in line with the number of beneficiaries.

During the course of this contract, the quality and accuracy of the SIO data has improved markedly. The transfer of information from the SIO to the HIO has become fairly accurate, at a greater than ninety (90 percent) percent rate. PIO data, however, continue to be a problem today. The governmental databases are not up to date, nor are PIO personnel motivated to provide the data, either by incentives or by collection of premiums within the organization. As a result, data for much of the pensioners, widows and governmental employees are either missing or inaccurate. This necessitates the generation of data for these persons as 'non-beneficiaries'within the HIO, a process which is both time consuming and inefficient for a group this large.

The HIO is undoubtedly losing money because it has no way to assess whether the payments it is receiving from the PIO match the beneficiaries it is treating. In addition, ineligible beneficiaries may be receiving service at a significant cost to the HIO as under the current system PIO beneficiaries who are not found in the database are being created as non-eligible beneficiaries and are served anyway.

The lessons learned under this contract should be watched closely in the design and implementation of other projects. The level of effort expended by both the HIO and the contractor to build an accurate beneficiary database were many times what anyone had anticipated in the project design or planning process. The delays caused by the lack of core data, the fact that neither HIO nor the contractor had direct control over any of the inputs to this central piece of the system, and the level of effort that could not be expended in other areas because it was consumed with data conversion should serve as a lesson in the design of other data driven projects. If a core database is necessary for success, its availability must be ascertained in advance and the necessary preconditions met.

3.8 IMPLEMENTATION

Implementation is the convergence of all the above tasks. A site must be prepared, the core database converted and put in place, the software loaded, and users and support staff trained. All sites, except those cancelled or under renovation (per the list in Exhibit 3-1), have been implemented. A few (mainly in Canal Branch) are not using the system yet due to personnel shortages.

Since 1996, the HIO and the contractor have been working together on implementation. Though the activities listed in the above paragraph are the contractual responsibilities of the MAXIMUS team, getting a site to actually use the MIS entails much more. Two items that were continual delay points throughout the contract were as follows.

o **Furnishings:** The HIO was responsible for furnishings. In many instances tables did not exist on which to place the computer hardware. This issue remained ongoing for many years. However, in the last two years of the contract, the HIO did manage to buy adequate furnishings. In many places however, desks and chairs provided to computer users are not ergonomically designed and cause awkward usage of the computer. The contractor is concerned about the potential for repetitive motion injury among HIO staff because of this.

o **Personnel:** In many polyclinics and hospitals, especially in the pharmacies of those facilities, there were staffing shortages. Facility managers would not or could not supply the necessary numbers of staff to operate the MIS. In some facilities, certain modules of the MIS are still not being used because of the shortages of staff.

However, HIO MIS Center staff and contractor staff working together resolved many implementation obstacles, such that all modules are up and running in the majority of facilities. Contractor staff taught HIO staff how to plan for implementation activities using MS Project, how to monitor activities and chart progress. A system of green, yellow and red alerts was developed by the HIO for monitoring implementation steps. **Since May 1998, the HIO has been successfully managing all implementation activities with limited contractor assistance.**

3.9 DATA ANALYSIS

By early 1997, the number of sites on-line with the HIO MIS grew to a level where the opportunities for data analysis were vast. Both the HIO and the MAXIMUS team hired Ph.D. data analysts to mine the wealth of data being produced. Some of the most interesting findings were as follows:

o   Number of drugs per prescription differed dramatically by physician specialty. *Exhibit 3-6: Number of Drugs per Prescription by Specialist Type Airport Clinic (April 1997-March 1998)*, shows these results for a 12-month period at El Mattar (airport) clinic in Cairo.

o   Costs per prescription differed by specialty as well. *Exhibit 3-7: Range of Prescription Costs by Specialist Type Airport Clinic (April 1997-March 1998)* shows these results for the El Mattar clinic in the April 1997 to March 1998 time period.

o   The costs per prescription when the diagnosis was a common cold varied drastically by treating physician. *Exhibit 3-8: Common Cold Drug Cost per Physician at Gleem Clinic*, shows the results for the Gleem clinic for various internal medicine, ENT, Chest and general physicians working at the Gleem clinic.

o   *Exhibit 3-9: Prescription Drug Price for an Episode of Common Cold*, compares the average prescription cost for a diagnosis of common cold across three HIO polyclinics – Gleem, El Mattar (airport) and Heliopolis. The intraclinic and interclinic differences are interesting. In particular, the amount of variation at the Heliopolis clinic is striking. Further analyses regarding the costs of practices for treating common cold were performed, including a detailed study of the types of drugs being prescribed. As shown in *Exhibit 3-10: Drug Groups Prescribed for Common Cold*, systemic antibiotics were the second most commonly prescribed drug for the common cold at El Mattar (airport) clinic, and the third most common at both Gleem and Heliopolis. This despite the fact that common cold is viral, not bacterial in origin. Therefore antibiotics are typically not effective and their overuse serves to increase strains of resistant bacteria.

Exhibit 3-6

NUMBER OF DRUGS PER PRESCRIPTION BY SPECIALIST TYPE
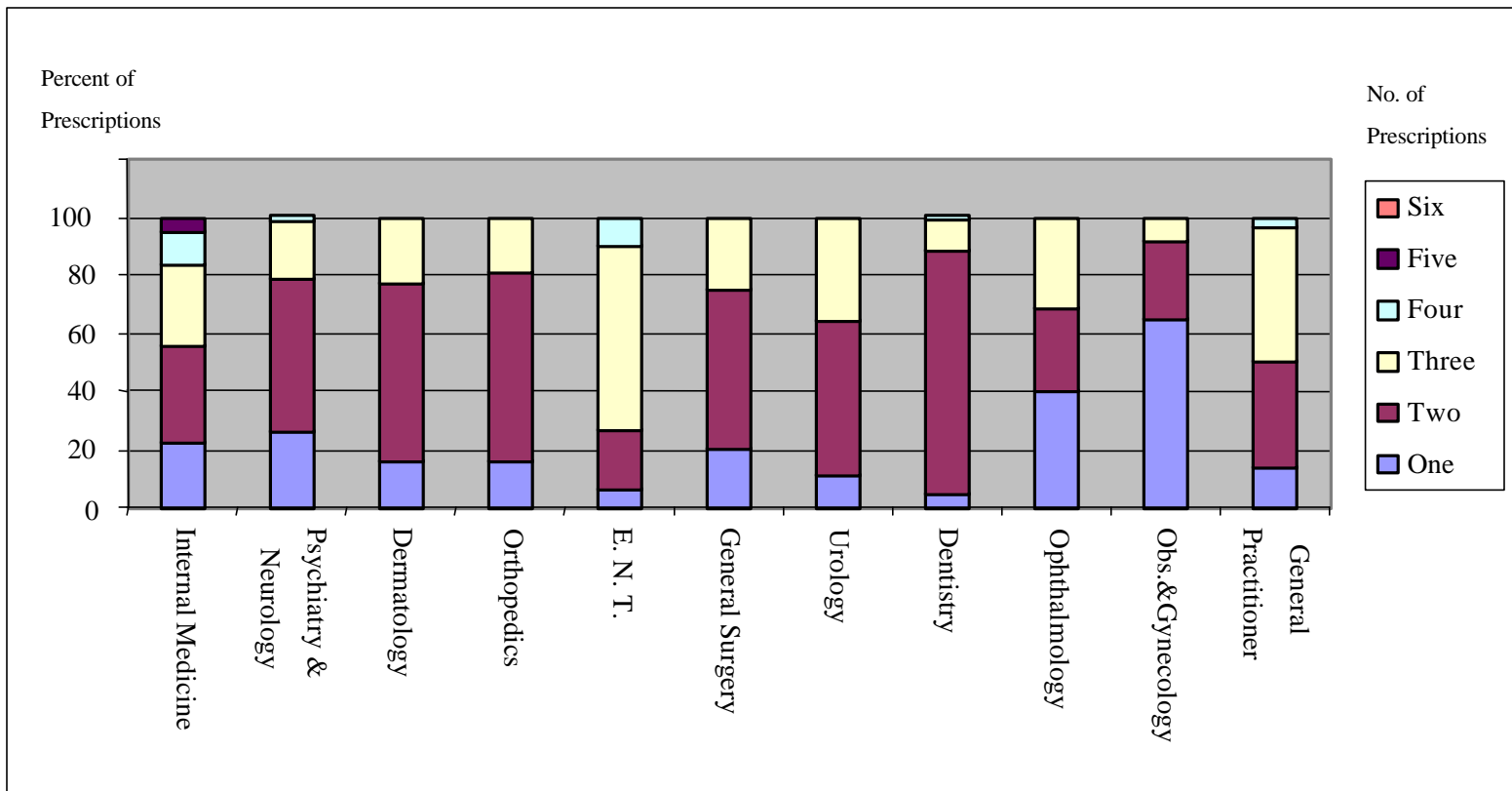# AIRPORT CLINIC (APRIL1997-MARCH1998)

Exhibit 3-7
RANGE OF PRESCRIPTION COSTS BY SPECIALIST TYPE
AIRPORT CLINIC (APRIL1997-MARCH1998)

Prescription Cost
in Egyptian Pounds (LE)

Exhibit 3-8
COMMON COLD DRUG COST PER PHYSICIAN AT GLEEM CLINIC

Drug Costs in
Egyptian Pound (LE)

Legend:
— 75%ile
— 25%ile
+ Median

X-axis categories: Int., ENT, Int., Chest, Int., Chest, GP, GP, GP, GP, GP, Int., GP, GP, GP

Y-axis: 0, 2, 4, 6, 8, 10, 12, 14, 16

Exhibit 3-9
PRESCRIPTION DRUG PRICE FOR AN EPISODE OF COMMON COLD

Egyptian Pounds (LE)

Exhibit 3-10
DRUG GROUPS PRESCRIBED FOR COMMON COLD

Gleem

Airport

Heliopolis

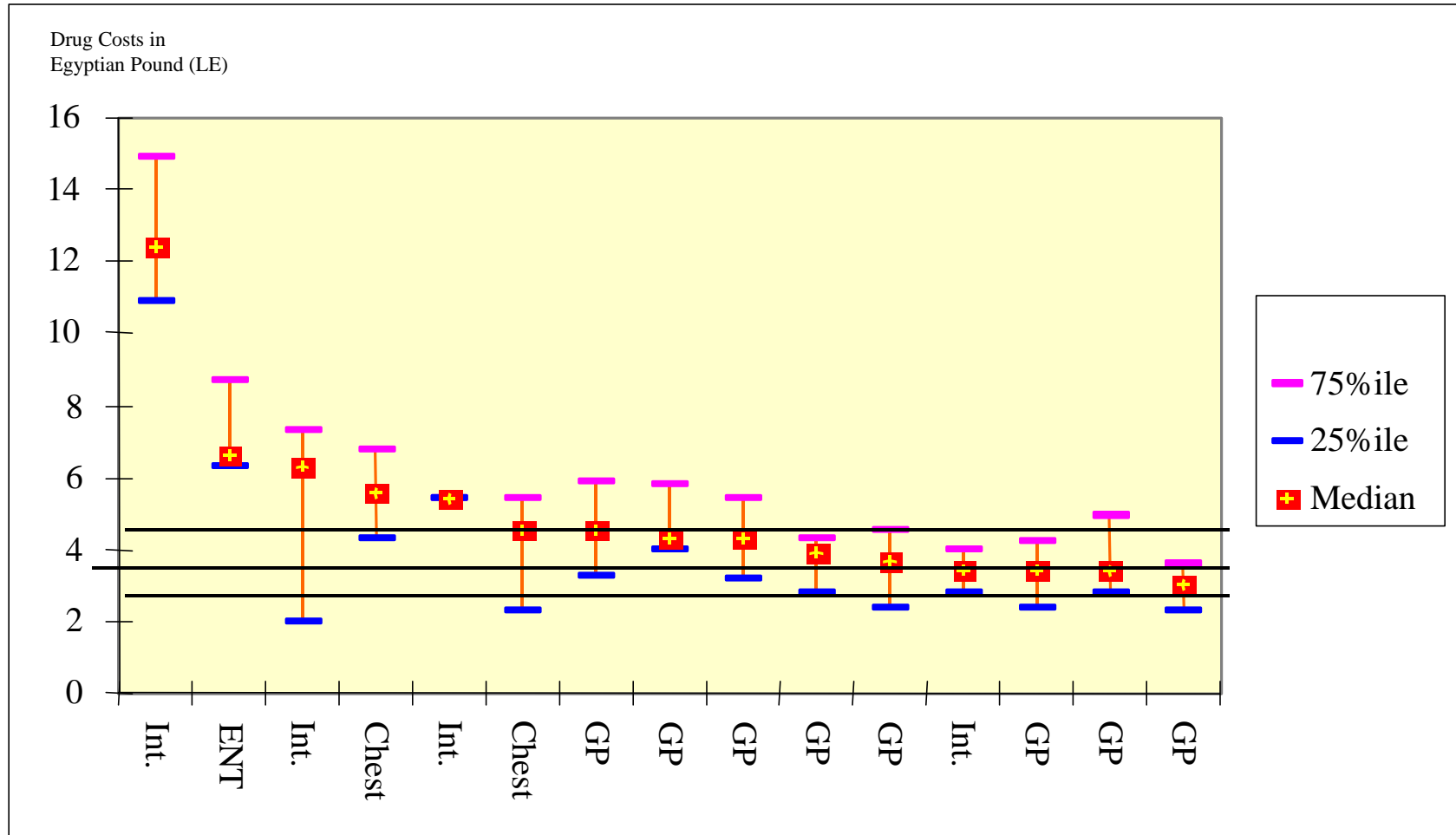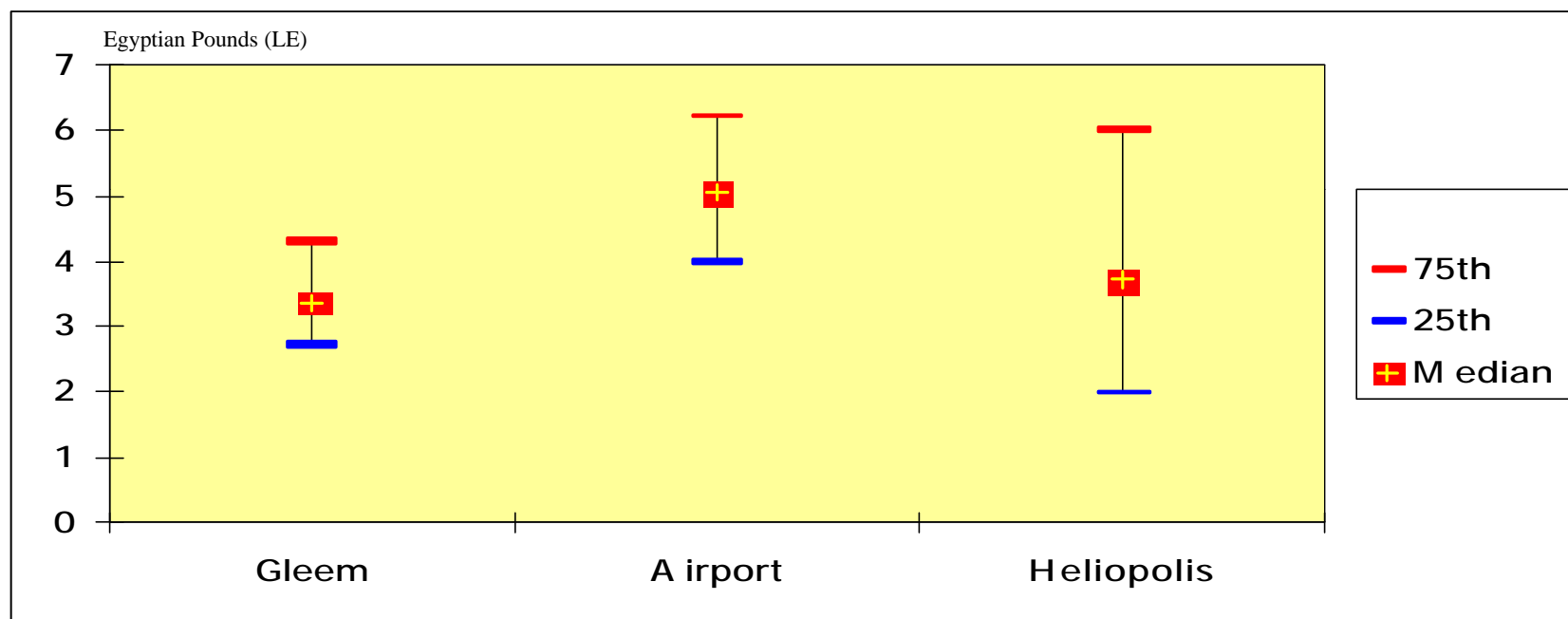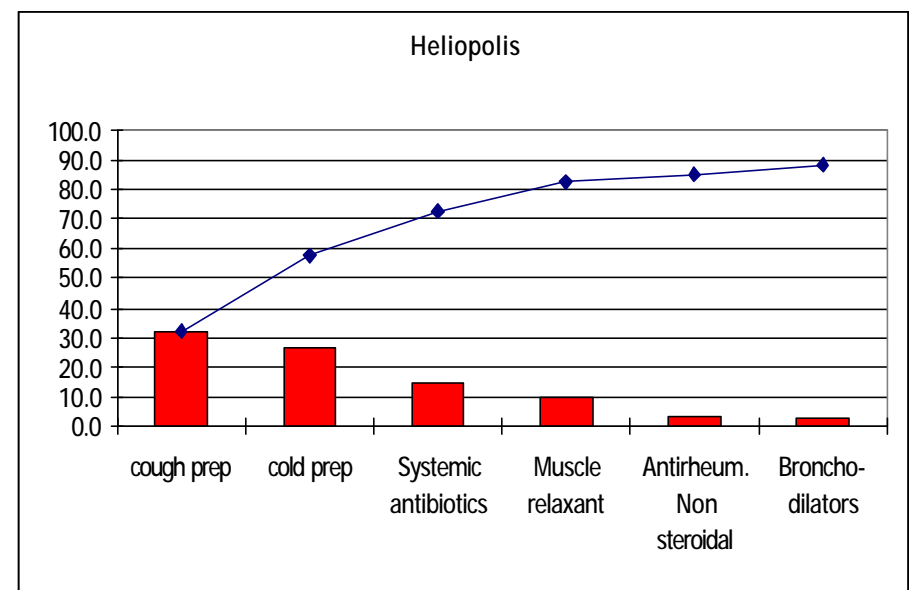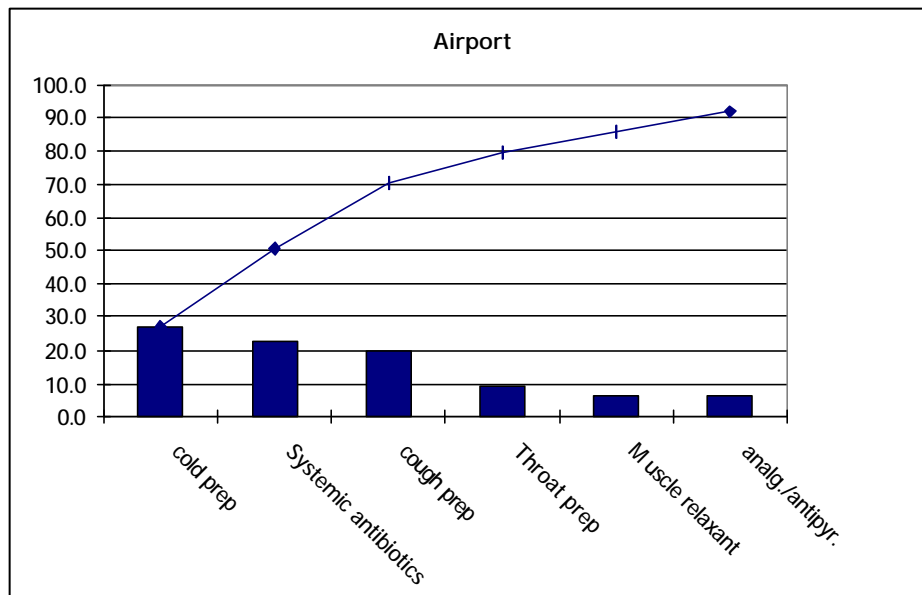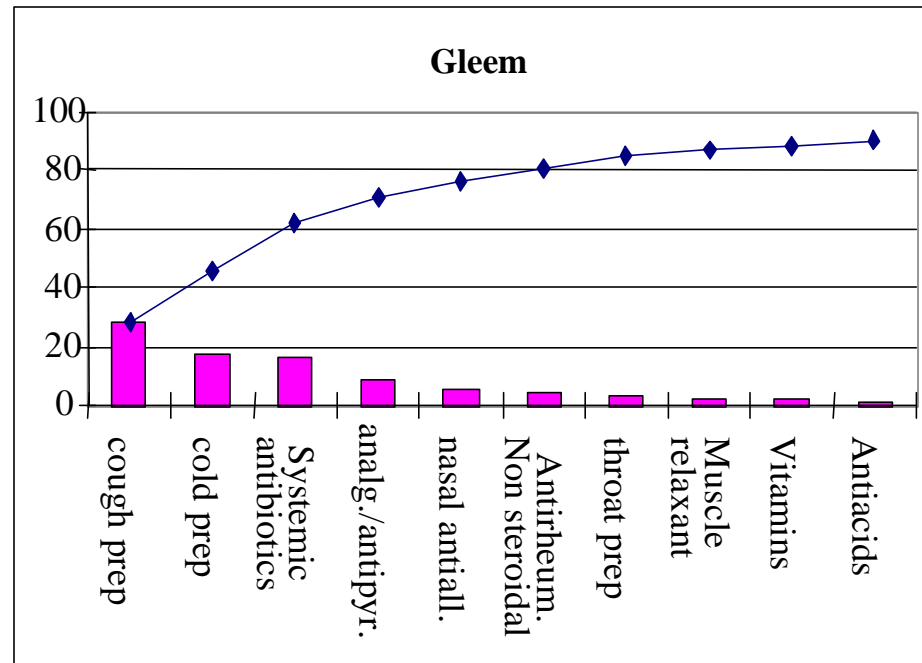o   Additional indicators of drug costs were studied such as price per prescription, price per visit and price per beneficiary per year (see *Exhibit 3-11: Various Indicators of Drug Cost*).

In the spring of 1998 meetings were held with top level HIO managers to review the wealth of analyses done. The HIO was urged to look closely at these results and develop plans for further study of practice patterns and especially drug usage. The data clearly showed there was great variation in practice and therefore a large opportunity for cost savings if practices could be standardized to the most cost effective yet quality driven methods.

In addition, the data analysts studied the validity of the HIO MIS database. The database itself is designed to collect a broad and useful range of data. However, not all data were being filled in or were being filled in incorrectly. In particular, the analysts showed the following.

o   Many clinics were filling in the ICD (disease) code more than 80 percent of the time, but a large number were also doing so less than 70 percent of the time. The ICD code is critical to most useful analyses. It is the treating physician's responsibility to mark this code.

o   Some physician specialties were more likely to use an incorrect ICD code when filling out the medical record, therefore introducing inaccurate information into the patient's electronic medical chart and weakening the validity of analyses done using that data.

o   Procedure codes were not being used in the majority of sites.

As was discussed in Section 3.5.3, proper use of the ICD and procedure codes is essential to the MIS and to the HIO's future ability to assess its patient disease patterns and therefore future costs of care. The analysis of the database can assist the HIO in targeting those facilities and specialties that require additional training. In this way the database is used to create further improvements within itself.

3.10 YEAR 2000 COMPLIANCE

The Year 2000, or Y2K, problem refers to the way many computers, operating systems and programs deal with dates. When computer memory was more expensive, it was common practice to use a six-digit date (YYMMDD), with only two digits for the year. For example, December 31, 1999 is represented as 991231. At the upcoming century change, January 1, 2000 (000101) is indistinguishable to the computer from January 1, 1900 (000101). Both use the two digits '00' to represent the year.

The HIO MIS, like all computer systems, has four main areas of vulnerability with regards to the Year 2000 problem. These areas are:

Exhibit 3-11
VARIOUS INDICATORS OF DRUG COSTS
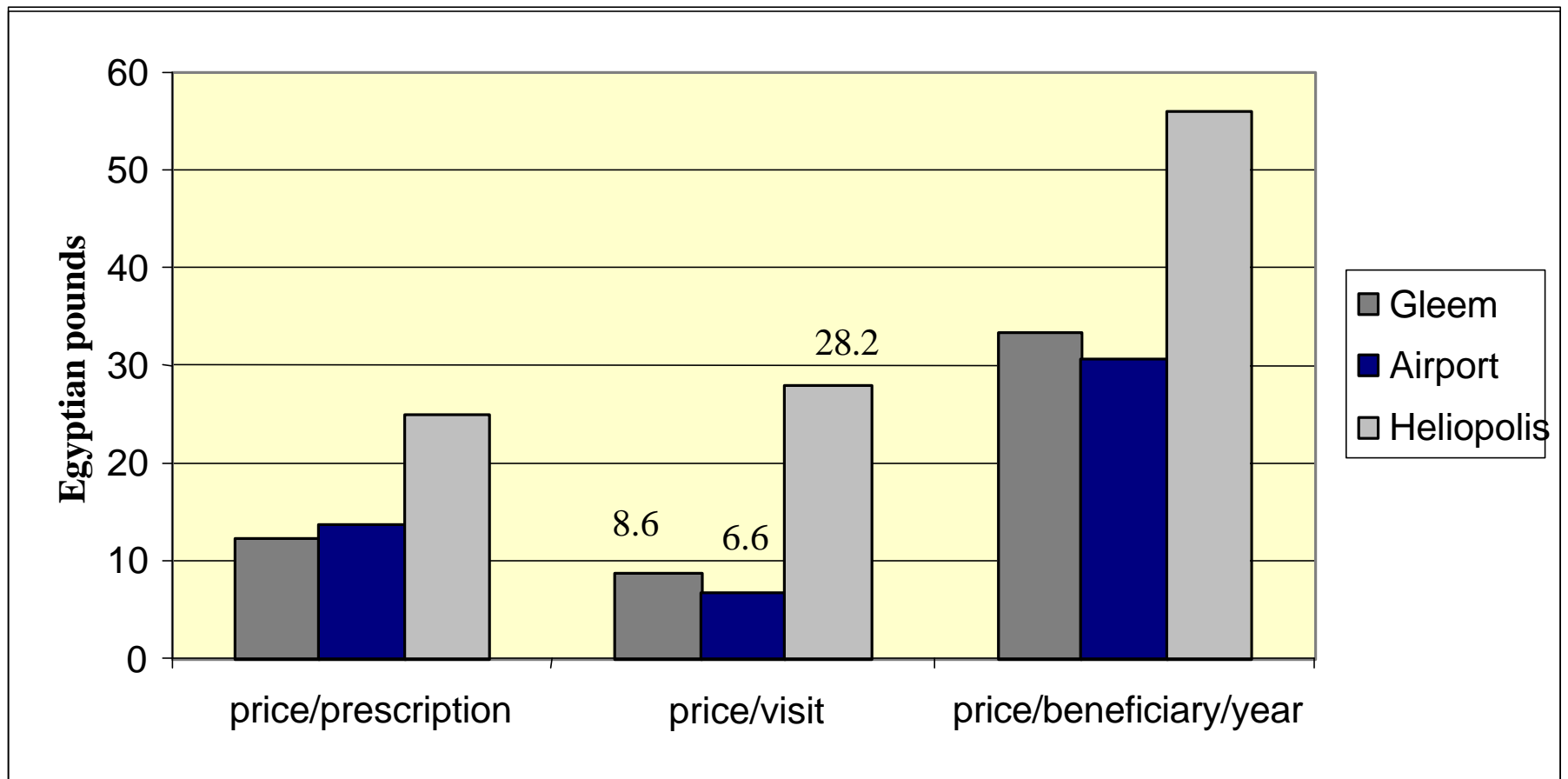
o   the applications software (code of the MIS),
o   the database engine and application tools (Oracle),
o   the operating system (UNIX), and
o   the computer hardware (supplied by NCR).

The HIO has a great advantage in regards to the Year 2000 problem, as it has complete access to the code of its application software. In addition, the programming standards put in place by the MAXIMUS team in 1993 required four-digit year representation.

As stated above, the programming standard instituted by MAXIMUS was a four-digit year. In theory then, all applications modules coded under the MAXIMUS contract should be Y2K compliant. However, despite standards and frequent program reviews, every programmer does not always adhere to standard. Therefore in 1997 and 1998 the MAXIMUS team conducted a thorough review of all modules developed under our contract. All modules except the cost accounting module were found to be compliant. The cost accounting module was corrected utilizing a "sliding window" algorithm.

The second area for concern is with the underlying relational database management system and development tools (Oracle products). As of 1998 Oracle was representing Version 7.3.2 of their RDBMS product as Y2K compliant. The MAXIMUS team created an Oracle tape and upgrade process that is being implemented by HIO MIS Center operations staff. Running this upgrade tape on each server will bring HIO MIS servers up to Oracle Version 7.3.2. **As of April 1999 this upgrade was 40 percent complete. The HIO operations staff has the skills and tools to complete this upgrade. It is imperative that they complete this upgrade early in 1999 so they can move on to other Year 2000 issues. Also, the HIO has not continued payments for a maintenance contract with Oracle (MAXIMUS was previously paying for this.) The HIO should investigate its access to future Oracle version upgrades if they cease maintenance. (However, Oracle/Egypt has agreed to provide the HIO with the upgrade to Version 7.3.3.)**

The UNIX version running on HIO servers is also not Year 2000 compliant. The HIO must purchase the compliant version. Furthermore, this upgrade should not be started until after the Oracle upgrades are complete. The HIO MIS operations staff has previously completed one full UNIX upgrade to an earlier version. Therefore staff knows the process and has the skills necessary to complete the job. The issue is one of timing and management.

The HIO has an advantage in that all hardware has been procured from one vendor, NCR. During 1998 NCR reviewed the hardware provided by them under this contract. Forty-four PCs procured in 1993 were found to be non-Y2K compliant. The MAXIMUS team procured replacement PCs prior to the close of the contract. Some computer servers were also found to be non-Y2K compliant, but required only a field upgrade to their bios to meet Y2K standards. MAXIMUS has written the procedures such that the HIO operations staff can perform this upgrade at the same time the new version of UNIX is being loaded.

There are two further caveats of which the HIO must be aware.

o   **The MAXIMUS team completed all research, investigation and resolution of the Y2K issues in 1998. Vendors such as NCR and Oracle may alter their assessments of their products as they perform further testing and as the century change draws nearer.** The HIO should appoint an individual in the MIS Center to monitor new developments regarding Year 2000 issues.

o   **A thorough analysis was conducted of the applications software. However,** *no complete system Y2K test was run.* This can only be done once the Oracle, UNIX and bios upgrades are complete in a set of sites. Then production computers in many sites on the network must simultaneously reset their clocks to December 31, 1999 and operate for several days into the fictitious Year 2000. Since this test has not been performed, the HIO should be prepared for the possibility of undetected software glitches.

Overall, however, if the HIO implements the remaining system upgrades, the MIS should be very close to being fully Y2K compliant. Appendix B contains the Year 2000 Summary of Activities prepared by the contractor in April 1999 and provided to HIO and USAID.

4. RECOMMENDATIONS

Over the course of this contract the MAXIMUS team has written many memos and papers on the sustainability of the HIO MIS. In particular, the Open Issues section of each QPR is a good reference for areas where the HIO should direct its attention when implementing additional sites. This section recounts some of the major sustainability items and offers other recommendations as the HIO moves forward into a potentially changing world of Egyptian health insurance.

4.1 SUSTAINABILITY

Most sustainability issues have been described in detail many times before. For those items that have been covered in detail in other documents we mention them just briefly below:

o   **Expendable Supplies:** The computer system cannot function without paper, printer ribbons, preprinted forms, and so on The MAXIMUS team has provided the HIO with expected annual budgets for these items on multiple occasions, for inclusion in the HIO annual budget plan. In addition, though money may be available, the HIO has previously had difficulty assessing when items will be needed, such that they are ordered and delivered in time. Distribution from a central site had also occasionally been an obstacle.

o   **Equipment Maintenance and Replacement:** Over time, equipment breaks or becomes obsolete. The HIO has put together a maintenance workshop within their MIS Center. Although some equipment may be repaired in this way, if the HIO can hire qualified technicians, most equipment will still require some outside vendor

support. Also, a long-term plan should be put in place for the gradual and continual replacement and upgrading of all computer equipment.

o **Maintenance for Operating Software:** New versions of UNIX and Oracle are released periodically. If the HIO keeps current maintenance contracts with the vendors (NCR and Oracle), new versions are usually included. HIO should assess its need for new releases against the costs of buying upgrades as needed.

o **Beneficiary Data:** As was described in Section 3.7 of this document, the HIO currently relies on the SIO and PIO for its beneficiary eligibility data. The HIO should closely review any changes in these relationships and be prepared with other data options should the environment change.

o **Telecommunications:** The HIO network relies heavily on X.25, a backbone that in 1993/4 ARENTO was pushing as its nationwide solution. This has not come to pass, although ARRENTO does not yet have any other nationwide network to offer. It is likely, however, that ARENTO will phase out support of X.25. The HIO must stay abreast of the directions telecommunications is taking in Egypt and make plans to change. (Web-based solutions, as described below may offer a suitable alternative for some sites.)

o **Ongoing Telecommunications Costs:** Regardless of the network design used by HIO, the HIO must budget for and continue to fund the maintenance and ongoing line charges for the telecommunication network that links all sites.

o **Salary/Incentives:** The HIO MIS Center now has a cadre of skilled technical individuals. Even in facilities, computer operators trained in UNIX have marketable skills. Thus far, turnover has not been unreasonably high, however the HIO should pay close attention to its salary and incentive plans for technically skilled employees.

o **ICD-9 Code Training:** The ideal is that physicians would be taught ICD-9/10 coding while in medical school as a part of the standard curriculum. However, in the absence of this the HIO must provide ongoing training and management pressure for HIO physicians to follow ICD-9 coding practices.

Perhaps the most important item for the sustainability of the HIO MIS is that it gains management support and recognition. Although many facility managers and the MIS Center staff are ardent supporters of the system, the MIS still does not have the attention of the top management of the HIO. This is not an uncommon situation in organizations automating for the first time. Managers are often uncomfortable with the clear and irrefutable nature of hard data. This is especially true in physician run organizations, where disciplining or imposing standards of practice must be done on one's peers – other physicians.

4.2 FURTHER RECOMMENDATIONS

Two recent Deliverables #29: **Implementation Report** and #31: **Post-Implementation Review**, both describe other avenues HIO may wish to explore. This section reviews some further recommendations.

4.2.1 Functionality Enhancement for the MIS: Configuration Control

Now that the end-user applications of the HIO MIS are stable, attention can be turned to enhancing the functionality of the system. During system development there were constant requests for alterations to the system functions. In many cases this was because manual operations are not standardized across all HIO facilities. Now is the opportunity for the HIO to use the automation in place to set and enforce standards where desired and promote efficient operations. In addition to fine tuning the existing applications, the HIO has the staff qualified to create new applications to meet emerging needs. However, all changes to the system must be made in a controlled fashion, in accordance with a long-term vision for the MIS.

In July 1998, a committee was established called the End User Configuration Committee. This committee had been recommended in February 1996 as part of Deliverable No. 20. Among the duties of this group are decisions regarding which user requests are implemented as enhancements or new applications. Often times, user requests submitted to the Committee conflict. It is the charter of the End User Configuration Committee to resolve these conflicts and select the most beneficial requests for implementation.

The End User Configuration Committee works in conjunction with the Helpdesk to gather information on system usage in the facilities. The information is used to assess the status of facilities in terms of their user training, as well as hardware and software performance. This End User Configuration group will eventually have the best overall vision of the MIS. It is vital that the HIO continue to support and provide the necessary direction for this extremely important group.

4.2.2 MIS Center Middle Management

The training of technicians at the HIO MIS Center at 20 Al Ahram Street has been quite successful. The HIO now has a cadre of employees with computer operations, database, analysis and programming skills. **The HIO should be aware that only a few of these individuals are seasoned in their experience, so outside technical assistance should still be sought for complex projects.** However, the technical talent does exist. Plus the HIO has the training management skills to renew this talent as employees move on.

Unfortunately the same cannot be said for middle management at the MIS Center. There is a strong Director, with good technical staff. A mid-level management team remains to be developed. The contractor put in place an organizational structure to accomplish this (through pairing HIO shadows with MAXIMUS team managers). However, most of these shadows were moved to other positions within the HIO or left the organization even before they had gained the

necessary skills. Without a capable middle management, the strengths of the technical staff and the Director risk being overrun by management and administrative issues

4.2.3 Finance System

One set of applications clearly missing in the HIO MIS is financial applications. The HIO has, and has had for years, a significant budget deficit. Yet, the original MAXIMUS contract contained no tasks for creating financial software or integrating new financial processes into the HIO. During modification #2, a deliverable was added to do a feasibility study for finance applications. This deliverable was completed in June 1996, and is a part of the overall Deliverable #5, **Functional Design Document**. It reviews current HIO financial activities and makes recommendations for HIO financial and accounting automation. At a later date, budgets for building these applications were submitted to USAID but not funded. The contractor continues to recommend that some level of automation be added to the HIO financial process.

4.2.4 Build Analytic Capacity

The data available from the MIS is wide ranging and offers a wealth of potential for management decision making. However, the HIO has no management analysis group that specifically serves the top levels of the organization. As was mentioned previously in this document, there is a concern that the top managers at the HIO are uncomfortable with the data emerging from the MIS. These data point to the need for treatment pattern changes and the enforcement of standards of practice – a difficult mission in any peer led organization, such as the physician-run HIO. However, if the HIO wishes to make full use of its MIS investment, the contractor strongly urges the HIO to hire a group of senior data analysts with experience in modern management theories. This management analysis group would work together with the top HIO management team to determine areas for investigation, change and monitoring that are within the HIO's comfort level for change.

4.2.5 Coordinate with Goals of Other Efforts

The HIO cannot plan for its future as if it were in a vacuum. For example, the Ministry of Health and Population's Health Policy Sector Program (HPSP) could have an immense impact on the operations of the HIO if a plan for universal health coverage (UHC) is implemented. As the Technical Support Office (TSO) for the HPSP is implemented at the MOH, the HIO should provide qualified HIO MIS Center staff to that office in order to facilitate coordination.

The HIO should continue to work closely with the SIO and PIO regarding beneficiary data. In addition the HIO should build ties to other organizations with potentially useful database. For example, any further developments in the National Identification number should

be watched closely. In coordinating with other entities involved in determining the future of health care provision in Egypt, it is likely that new strategies for expanding the HIO MIS will surface. Plans relating to these strategies could be implemented by the HIO with the proper analysis and technical assistance.

4.2.6 Keeping Current With Technology

As the world continues to find new and effective uses for the Internet, it is inevitable that Egyptian healthcare organizations will want to capitalize on the benefits the Internet offers. The use of the Internet in the provision of Egyptian healthcare could take many forms.

One use of the Internet could be in the development of a substantial knowledgebase to be used by physicians. The knowledgebase would contain information on disease management, treatment protocols, and the recent advances in health care techniques. Giving physicians access to such useful information would improve the ability to deliver care, and at the same time make physicians feel part of a worldwide medical community.

Another use of the Internet would be to convert the existing MIS applications to a Web-based solution. This would allow for much easier data collection and transfer throughout the organization. The Oracle database and development tools that are the base of the HIO MIS are well suited to Web-based solutions. Upgrading the existing MIS applications to be Web-based would keep intact the work done to date.

A specific and very practical application of web-based technology would be to develop a Point-of-Sale (POS) application for the Contracted Pharmacies module. This would enable private pharmacies that contract with the HIO to check eligibility on line. In addition, it would enable data collection at the pharmacy level, reducing the data entry burden for the HIO. Ultimately a much faster payment turnaround time would be possible, limited only by the HIO's need to delay payment for cash flow purposes.

Another area of technology the HIO may wish to explore is Graphical User Interfaces (GUI). Currently the HIO MIS interface is character-based rather than graphical. GUI is not essential for most heads-down data entry operations, and requires PCs rather than dumb terminals in all locations. PCs are more expensive to procure and maintain than are dumb terminals. However, GUI looks more modern and outside evaluators of the system will react more favorably if the interface is graphical. In an environment of tight funding, the value of this should not be overlooked for the long run.

Much of the HIO MIS has already been converted to a Windows-based interface using Oracle Developer 2000. This creates a more user-friendly environment, and allows for greater operational flexibility and enhanced report presentation. However, the HIO currently does not have PC's in its facilities on which to implement a graphical solution. The HIO MIS Center has licenses for and knows how to operate Oracle Developer 2000. The technical capability is there to complete a character to GUI initiative.

5. LEVEL OF EFFORT

The total Level of Effort (LOE) for the contract is 2,094 person-months (as modified in Amendment #10). A summary of LOE usage, by employee category, is shown in *Exhibit 5-1: Level of Effort by Employee Category (Person-Months) Through June 20, 1999*. Though there remain 3.3 person-months under the contract, there are no additional funds to use these person-months. Previous Quarterly Progress Reports had contained errors in LOE calculations, leading to an underreporting of short-term expatriate time and an overestimate of home office technical support required. This had affected LOE estimates during previous contract modifications. The LOE figures in *Exhibit 5-1* have been, for MAXIMUS employees, calculated anew directly from the MAXIMUS timesheet database.

6. EXPENDITURES

The total budget for the contract is $23,457,925 (as modified in Amendment #10). *Exhibit 6-1: Budget Status Through June 20, 1999*, shows, by budget category, the budget status through the close date of the project.

7. REPORTS PRODUCED UNDER CONTRACT

During the course of this contract many documents, both deliverables and non-deliverables alike, were created. The purpose was to document, educate and further leave for the HIO a written history of the project. The following sections list both non-deliverable and deliverables produced under this contract and the dates these were published or completed.

7.1 DELIVERABLES PRODUCED UNDER THE CONTRACT

Exhibit 7-1: Status of Project Deliverables, details the deliverables produced under this contract, their status and delivery dates. As can be seen from the exhibit, all deliverables due were completed.

7.2 NON-DELIVERABLES PRODUCED UNDER THE CONTRACT

There were two types of non-deliverables produced under this contract – documents and video tapes. *Exhibit 7-2: Non-Deliverables - Documents*, details the non-deliverable documents produced under this contract. *Exhibit 7-3: Non-Deliverables - Video Tapes*, details the video tapes.

Exhibit 5-1
LEVEL OF EFFORT BY EMPLOYEE CATEGORY
(PERSON-MONTHS) THROUGH JUNE 20, 1999

Employee Category	Contract	Used Cumulative	Remainder
Expatriate (long term)	390	389.46	.54
Expatriate (short term)	7	8.52	(1.52)
Local Professional	1,216	1,213.43	2.57
Local Support	348	349.39	(1.39)
Home Office Technical	122	119.23	2.77
Home Office Administrative	11	10.67	.33
Total	**2,094**	**2,090.7**	**3.3**

Exhibit 6-1
BUDGET STATUS THROUGH JUNE 20, 1999

Description	Billed thru ($) June 20, 1999	Total Budget ($)	Balance ($)
Salaries	2,326,991	2,325,102	(1,889)
Fringe	870,449	869,754	(695)
Overhead	1,512,968	1,511,941	(1,027)
Travel	198,121	244,871	46,750
Allowances	163,508	165,056	1,548
ODCs	262,415	258,399	(4,016)
Commodities	1,130,676	1,141,581	10,905
Training	246,479	257,745	11,266
Subcontractors	13,136,221	13,073,454	(62,767)
G & A	2,408,891	2,408,902	11
Fixed fee	1,201,120	1,201,120	0
Total	**23,457,840**	**23,457,925**	**85**

Exhibit 7-1 (Page 1 of 7)

STATUS OF PROJECT DELIVERABLES

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STATUS OF PROJECT DELIVERABLES

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STATUS OF PROJECT DELIVERABLES

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STATUS OF PROJECT DELIVERABLES

Exhibit 7-2
NON-DELIVERABLES - DOCUMENTS

Document Name	Date Submitted
Guide for HIO MIS Trainers (English)	November 30, 1998
Workshop on Training Intervention Planning: results of Follow-Up Visit and Testing of Polyclinic End Users	November 25, 1998
Guide for HIO MIS Trainers	May 1998
HIO MIS Help Desk Charter (Arabic/English Version)	May 1998
Recommendation Concerning Project-Sponsored Technician Training for HIO HQ MIS Center (Al Ahram), Canal, and Cairo Branches in 1997	March 5, 1997
Report on Follow-Up Visit and Testing of MIS-Trained End-Users in Cairo Branch Polyclinics	December 29, 1996
Implementation Progress Report of HIO Integrated healthcare Operations	August 1996
Consultant's Report: Communications component of the HIO Reengineering/Reorganization Initiative	August 18, 1996
Assessment and Recommendations Medinat Nasr Hospital	July 24, 1996
Assessment and Recommendations Gamal Abd El Nasser Hospital	July 24, 1996
HIO Financial Systems Automation Feasibility Study (part of Deliverable #5, Functional Designs)	June 16, 1996
Implementation Progress Report of HIO Integrated Healthcare Operations	
Preliminary Study for Quality Assurance for the Health Insurance Organization	August 30, 1995
Reengineering of the Health Insurance Organization Headquarters Draft Final Report	June 2, 1995
Comments Regarding the Management Development Module	November 7, 1994
CRHP Administrative System Users Manual	November 1994
End of Tour Report August 2, 1993 – August 4, 1994	August 31, 1994
Proceedings of the Project Start-up Workshop January 31 – February 3, 1994	August 10, 1994
Life of Project Training Plan	March 28, 1994

Exhibit 7-3
NON-DELIVERABLES – VIDEO TAPES

TAPE NAME	DATE SUBMITTED
Dr. Robert Frenck – CB Management and MQA Orientation Workshop: MIS – A Physicians Perspective (One Tape)	January 27-28, 1997
Orientation Workshop: "Management" "Cairo Branch" (2 Tapes)	January 1997
HIO: Source Codes	February 4, 1997
TOT on Training Concepts, Methods Tools and Management Canal Branch (Six Tapes)	May 11-15, 1997
Canal Branch Help Desk Orientation (2 Tapes)	May 17-20, 1997 (four days of which May 19-20, 1997 are taped)
MIS Management & Quality Module Assurance Orientation Workshop: Canal & East Delta (Three Tapes)	September 15-16, 1997
HIO MIS Center At Work (One Tape)	April 1, 1998
MU MIS Training Follow-up Meeting with Cairo Branch Polyclinic Managers (Two Tapes)	April 16, 1998
Help Desk Charter Workshop (2 Tapes)	May 14, 1998

APPENDIX A: TRAINING LIBRARY

The following items have been developed or procured for the HIO MIS Center Training Library. All have been turned over to the HIO MIS Lead Trainer, Madame Mediha.

Arabic Videos:	Video tapes of all MIS MMQA Orientation Workshops (all Branches)
	Video tapes of HELP DESK Orientation Workshops
	Video tapes of TRAINING OF MIS TRAINERS Workshops
	Video tapes of Management User Training on MIS applications for polyclinic managers
	Video tapes of Management User Training on MIS applications for hospitals
	Video tapes of the MIS Training Intervention Planning: Results of Follow up Visit and Testing of Polyclinic End Users Workshop
CBT (Computer Based Training) courses:	CBT UNIX: suite of four courses-UNIX User, Advanced UNIX User, UNIX Basic Systems Administration, UNIX System Administration File Systems, UNIX System Module
	CBT Oracle 7: suite of four courses: Oracle Server Programming, Oracle Server Development Techniques, Oracle 7 Applications Tuning, and Oracle 7 Query Optimization
	CBT Windows: suite of four courses: NT 4 Workstation and Server: Introduction to Windows NT, Administering Windows NT, Windows NT 4 Server Management, Windows NT 4 Policies, Profiles and Registry
	CBT course: Developer 2000 Graphics
	CBT course: Windows 95 Installation and Use
Other Training Videos, Skills Tests and Training Books and Exercises (English):	The TEAM Doctor - Video collection
	How to be a Better Trainer - Video collection
	Discovering the Internet - Video
	Windows 95 - Video
	Excel - Video
	Practical Coaching Skills for managers - audiotape set
	How to Interview and Hire the Right People - audio tape set and workbook
	Delivering Effective Training - Video collection
	Graphics for Presenters - Book
	Training Methods that Work: Delivering Effective Training Sessions - Books
	Thoughtware: Change the thinking and the Organization will Change Itself - Book
Other Training Videos, Skills Tests and Training Books and Exercises (English) (continued):	Supervisory Proficiency Tests
	Supervisory Skills Tests
	Management Practice Inventory

Management Training Needs Analysis
Leadership Effectiveness Profile
Leadership Skills Test
Coaching Competencies: Questionnaire Administration and Scoring Guide
Training Needs Assessment for Modern Leadership Skills
Job Skills Training Needs Assessment
Easy-to-Use Reengineering Activities
Training for Time Management
Hunt for T-REX: Video and participant booklets for this management skill development simulation exercise

APPENDIX B: EGYPTIAN HEALTH INSURANCE ORGANIZATION (HIO) SUMMARY OF YEAR 2000 (Y2K) ACTIVITIES

1.0. PURPOSE OF DOCUMENT

MAXIMUS has been working with the HIO since early 1998 to assess the HIO MIS Y2K issues. MAXIMUS has defined the areas for concern, has outlined the steps and activities which must be pursued and has provided the HIO with specific lists of items which must be procured, replaced, updated or tested in order to ensure Y2K compliance. To the extent the MAXIMUS budget would allow, MAXIMUS has procured Y2K replacement and upgrade items.

MAXIMUS has worked closely with the HIO throughout this process and HIO staff is technically trained to implement the solutions. However, MAXIMUS is concerned about the speed at which solutions are being implemented and about the lack of funds for procuring some of the necessary upgrades.

All information provided in this document has been provided at other times over the past fifteen months. This document serves to provide for the HIO and for USAID, in a single place, the outline of what has been accomplished to date and what remains to be done before the close of 1999.

2.0. Y2K STEPS AND STATUS

There are 4 steps in approaching the Y2K task. These steps are:

o   Building awareness,
o   Taking Inventory and Assessing the Problem,
o   Deployment, and
o   Testing.

The activities accomplished under these tasks and the status of each are described in the following subsections.

2.1. BUILDING AWARENESS

Starting in early 1998, MAXIMUS worked with the then HIO MIS Center Director and his Implementation Coordinator to build their understanding of the Y2K problem. This included defining the bounds of the problem to lie in four specific areas – the applications developed under the project, the underlying Oracle database products, the operating system (UNIX), and the many and various computer hardware components that make up the HIO MIS hardware network.

STATUS: By May 1998, the HIO MIS Center Director and his Implementation Coordinator were well versed in all the issues. Since the appointment of a new HIO MIS Center Director in October 1998, MAXIMUS has also provided her the written activity lists of what must be done to complete Y2K fixes by the close of this year. Part of the purpose of this document is to collect, in one place, a brief history and the remaining open issues to ensure the

new HIO MIS Center Director has the information she needs to follow through on the resolution of this critical problem.

2.2. TAKING INVENTORY AND ASSESSING THE PROBLEMS

The MAXIMUS automated inventory system made it a simple job to produce a physical count of hardware, BIOS, operating systems, database management systems, and all pertinent software. From this inventory list we were able to develop re-mediation plans for affected items.

In most cases the re-mediation plans had to be developed using information provided by the vendors (Oracle, NCR, and the sub-component manufacturers). Vendor information regarding Y2K issues has been difficult to obtain. No vendor will provide specific details about which functions will be affected or the specific problems that will manifest after the millennium change. Therefore we must accept what the vendors say about models, versions and components and the steps/procurements needed to fix the potential problems. Also, in the fifteen months MAXIMUS has been working on this issue, vendors have occasionally altered their statements about what is or is not Y2K compliant. For this reason we urge the HIO to continue close relationships with the vendors as information contained herein could change as the new millennium approaches**.**

MAXIMUS turned over the inventory system to the HIO in January1999. We do not know what mechanisms the HIO is currently using to tracking inventory. In an effort to be of assistance, the following two charts show the pertinent inventory (as of January 1999) which must be tracked as these items are critical to the Y2K compliance activities.

Table 1 shows pertinent hardware; Table 2 shows pertinent software. Both tables show the item type, its function, the quantity of these items, whether or not it is already Y2K compliant (NC = Not Compliant, C = Compliant), and the re-mediation activity that must be completed to reach Y2K compliance.

TABLE 1: HARDWARE ITEMS

1.1.1 ITEM	1.1.2 FUNCTION	1.1.3 QUANTITY	Y2K COMPLIANT	REMEDIATION
NCR 3230	PC	26	NC	Replace
NCR 3259	PC	24	C	
NCR 3335	PC	6	NC	Replace
NCR 3345	PC	12	NC	Replace
NCR 3410	Server	4	C	
NCR 3430	Server	1	C	
NCR 3431	Server	55	C	
NCR 3550	Server	1	C	
NCR S40	Server	28	C	
NCR S46	Server	4	C	
ADDS VT220	Monitor	1700 (?)	C	
Genicom 1224 (?)	Printer	250 (?)	C	
Genicom 6450 (?)	Printer	9 (?)	C	
(?)	Tape Drive	1	NC	Replace
Cisco 2500	Router	95	C	
Cisco AS/5200	Router	4	C	
Motorola 3266	Modem	81	C	
Motorola UPS	Modem	14	C	

STATUS of PC's: Table 1 shows forty-four (44) of the HIO PC's (all located at the MIS Center) were not Y2K compliant. The only resolution possible for these PC's was to replace them with new PC's. MAXIMUS procured new PC's in 1998 and delivered these to the HIO MIS Center. The HIO has not yet used these PC's to replace the Y2K non-compliant PC's and may decide to utilize them elsewhere. Also, the HIO is stalled in its distribution of these PC's because the HIO has not yet decided on a standardized PC configuration (for example, which PC's have Windows 95, Office 97, Developer 2000, and so on). All decisions should be made with the clear knowledge that continued use of the old non-compliant PC's may produce unexpected results after the millennium.

STATUS OF TAPE DRIVE: The HIO uses this tape drive for exchange of data with the SIO and PIO. A new tape drive that works under the Y2K compliant version of UNIX is available at the HIO. Unfortunately, the SIO and PIO do not have tape drives compatible with the HIO's replacement tape drive, so the HIO continues to use its old tape drive. In fact, the PIO no longer has this tape capability and the SIO may soon drop theirs. The HIO, SIO, and PIO need to decide upon what media to use to transfer the data. Then all three organizations must

procure compatible technology for data exchange. MAXIMUS recommends technical assistance be provided to these organizations to resolve this obstacle.

TABLE 2: SOFTWARE

1.1.4 ITEM	1.1.5 FUNCTION	1.1.6 QUANTITY	Y2K COMPLIANT	REMEDIATION
NCR 3410 Reference Diskette	BIOS/RBIOS	4	NC	Upgrade BIOS/RBIOS Release 2.0.8
NCR 3430 Reference Diskette	BIOS/RBIOS	1	NC	Upgrade BIOS/RBIOS Release 1.1.3
NCR 3431 Reference Diskette	BIOS/RBIOS	55	NC	Upgrade BIOS/RBIOS Release 1.1.3
NCR 3550 Reference Diskette	BIOS/RBIOS	1	NC	Upgrade BIOS/RBIOS Release 2.2.4
NCR SXX	BIOS/RBIOS	32	C	
UNIX 3.01	OS for Servers	95	NC	Upgrade to UNIX 3.2
Oracle 7.0	RDBMS	95	NC	Upgrade to Oracle 7.3.3
Developer 2000	Client/Server	11	C	
One Vision Node Mgr	Network Mgmt System	1	(?)	
AlifTerm 1.1.17	Terminal Emulator	24	NC	Upgrade to Dynacom 4.0
Arabic Windows 3.1	OS for PC	68	C (Issues)	
Arabic Windows 95	OS for PC	68	NC	No Plans for MS to make Compliant
Office 97	Desktop Publishing	68	C	
User Developed Apps	Beneficiary, Drug Control Med Rcds, Cost Acct	95	C	

STATUS OF UDA's: The User Developed Applications (the modules developed under the project) have been modified as necessary and tested under the Y2K compliant versions of UNIX and Oracle. They provide the same functionality as before as well as improved performance.

STATUS OF ALIFTERM: The previous HIO Implementation Coordinator had already obtained Dynacom 4.0 to replace AlifTerm. The HIO operations staff knows how to install this product. It has not yet been installed and must be installed on all PC's used for development in the HIO MIS Center.

STATUS OF ARABIC WINDOWS 3.1.1 and 95 (and all Microsoft Products): This affects only PC's, not terminals. For the HIO MIS, PC's are primarily located in the MIS Center and the Roxy headquarters. There are currently no Y2K compliant Arabic Microsoft products on the market and no published plans to release any. The HIO must consider its options regarding potential Y2K problems for these PC's and decide whether to move to non-Arabic Windows 98 (with Y2K patches), or other options that may appear on the market as the year progresses.

STATUS OF ORACLE, UNIX, BIOS: The following need to be upgraded on all HIO MIS servers for Y2K compliance.

- o   Upgrade Oracle to 7.3.3.
- o   Upgrade UNIX to 3.2. and
- o   Upgrade the BIOS.

Differing advice was obtained from Oracle and NCR regarding what was needed to install the Y2K complaint versions. At first Oracle stated that 64 MB of memory was required. NCR stated that 2 GB of hard drive space was required for the new UNIX version. At the same time, it was thought that increasing both memory and hard drive space (in a new configuration) might enhance overall MIS performance. After close to ten months of rigorous study, it was determined that both the Y2K compliant versions of UNIX and Oracle can operate under the original configurations. However, to meet vendor recommendations (as opposed to requirements) and to improve system performance, MAXIMUS purchased additional hard drives (only needed in Cairo branch clinics) and memory (only needed for those servers not already at 64 MB of RAM). The HIO has these upgrades and operations staff is trained to install them. Installation has thus far occurred in four clinics in Alexandria only.

MAXIMUS had been testing an upgrade to Oracle 7.3.3 before it was learned that 7.3.3 was the Y2K compliant version. The upgrade was being considered in order to resolve a suspected bug in the Oracle database that was causing performance problems. Therefore HIO had already been trained in the Oracle upgrade procedures.

NCR provided a price quote to the HIO in the spring of 1998 for upgrading all systems (UNIX, BIOS, memory and hard drives) for Y2K compliance. This quote was almost $800,000. MAXIMUS managed to procure the memory and hard drives (discussed above, and not specifically related to Y2K) for less than $40,000. The HIO continued to negotiate with NCR.

In March 1999, MAXIMUS learned the BIOS replacements could be downloaded without charge from the NCR website. This has been done and provided to the HIO.

The UNIX upgrade remains an issue, especially because the HIO did not continue a maintenance agreement with NCR after the MAXIMUS agreement ended in July 1998. As of April 1999, NCR policy is to charge HIO for the Y2K UNIX version. This is not an inconsequential cost.

2.3. DEPLOYMENT

Deployment is the implementation of the Y2K solution in the production environment. While it is hoped that this is the final step, an organization needs to be on the lookout for unexpected or unidentified problems. As has been mentioned above, MAXIMUS and the HIO have already developed a list of what needs to be replaced or upgraded. For each item, a specific plan for the replacement or upgrading has been created. In many cases this means master tapes must be made and servers must be upgraded. The HIO is technically trained to complete these tasks. The main issue is one of task management – the HIO MIS Center must give Y2K tasks priority, appoint an implementation coordinator, and stick to a schedule that will allow all activities and testing to complete early enough in 1999 to allow for resolution of unforeseen problems. MAXIMUS recommends the HIO have completed all the following tasks by September 1999.

The remaining activities to be accomplished by the HIO are as follows.

o   Replace the 44 non-compliant PC's at the HIO MIS Center with Y2K compliant PC's already procured by MAXIMUS and delivered to the HIO. Hold the non-compliant PC's for non-critical use. After the millennium change, it can be seen what functions these PC's can still perform for the HIO.

   COSTS: The new Y2K compliant PC's have already been provided to the HIO by MAXIMUS. There are no further procurements necessary, just staff time to do the replacements. HIO operations staff is technically qualified to perform this replacement activity.

o   Decide what PC operating system will be installed on the various PC's, despite a lack of Y2K compliant Arabic products. Also create standard PC configurations for the different PC uses (office automation, system development, management reporting). Reinstall all PC's with the appropriate configuration. Install Dynacom 4.0 on all development PC's.

   COSTS: New office automation tools or PC operating systems will likely need to be procured. Since the MIS has few PC's (less than 70), total cost would be unlikely to exceed $50,000.

o   Decide with the SIO and PIO which data exchange medium will be used to transfer beneficiary data. All three organizations must procure and install compatible, Y2K compliant media (for example, tape drives, CD's).

COSTS: The HIO must budget for a new tape drive or CD. The cost would be unlikely to exceed $3,000.

o   Complete Oracle Upgrade to Version 7.3.3 on all MIS servers. MAXIMUS has worked with the HIO to develop master upgrade tapes for all server types at clinics, hospitals and branches. The HIO operations staff has already completed the upgrade of almost 50% of the HIO MIS sites (19 Cairo clinics, 4 NWDB clinics, 6 East Delta clinics, Roxy Headquarters and the MIS Center). The remainder must be completed at a much faster pace to meet acceptable year-end deadlines.

COSTS: The upgrade version from Oracle was free because of the maintenance contract MAXIMUS maintained with Oracle. There are no further procurements necessary. (However, MAXIMUS strongly recommends the HIO continue a maintenance contract with Oracle, which it has not done to date.) HIO operations staff is technically qualified to perform this upgrade activity.

o   Upgrade BIOS on all MIS servers. In March, 1999 NCR policy allowed the BIOS upgrades to be obtained from the NCR website. MAXIMUS has obtained all BIOS upgrades and created the reference diskettes to be used for the upgrades.

COSTS: MAXIMUS obtained the BIOS upgrades at no cost. No further procurements are necessary. HIO operations staff is technically qualified to perform this upgrade activity. (For a fee of $700 per server, NCR will perform the BIOS upgrades in conjunction with the UNIX upgrade described below, but only after all machines have been upgraded to 64 MB of memory.)

o   Upgrade UNIX to Version 3.2. The HIO must obtain the new UNIX version from NCR, create upgrade master tapes for each server type at clinics, hospitals and branches, and schedule and perform the upgrades.

COSTS: As of March 1999, NCR policy is that implementation of UNIX 3.2 is a product change, not an upgrade. The estimated cost for procuring the new UNIX versions for the approximately 90 HIO servers is $400,000. HIO operations staff is technically qualified to perform the upgrades as they have previously upgraded UNIX on all HIO servers.

o   Upgrade the memory in servers to 64 MB, and hard drives to 2 GB (only Cairo clinics lack this currently). Although tests by HIO and MAXIMUS have shown that these upgrades are not necessary for Y2K compliance, they do enhance performance under the Y2K complaint versions of UNIX and Oracle and are recommended by the vendors.

COSTS: MAXIMUS has already procured and delivered to the HIO the memory and hard drive upgrades necessary. No further procurements are needed at this time. HIO operations staff is technically qualified to perform these upgrades.

2.4. Y2K TESTING

Testing requires that a full simulation of rolling over into the year 2000 be conducted across an integrated platform that includes networked servers of at least 2 clinics, one hospital, a branch and headquarters. This testing should be completed only after deployment of the Y2K fixes outlined above are complete.

Simulating a year 2000 rollover and several critical year 2000 dates need to be tested. Do all of the systems function correctly? Are there any unexpected results? The HIO can determine if the systems function correctly, but technical assistance from MAXIMUS would likely be needed in determining resolutions and changes.

3.0. WORKPLAN

MAXIMUS has provided to HIO operations staff activity lists for each of the above items. The deployment of fixes has been occurring for well over 6 months, but is moving very slowly. In some cases, such as with the memory and hard drives the HIO has run in to bureaucratic obstacles – in this case no one at the facilities wants to sign for these new parts that are being put in the machines. Since the inventory description is being changed, apparently it is an HIO rule that even these small upgrades must be signed for.

MAXIMUS estimates the following time frames would be needed to complete the activities.

Task	Resource	Duration
Complete Oracle Upgrade	HIO DBAs & Operators	6 months
BIOS Upgrade	HIO Operators	6 months
UNIX Upgrade	HIO Operators	6 months
Memory & HD Upgrade	HIO Operators	6 months
Simulate Y2K	MAXIMUS &Analysts	1 month
Tape Drive	HIO/SIO/PIO	?
PC Configurations	MAXIMUS/HIO	1 month

MAXIMUS has provided HIO operations staff with a method for performing the Oracle upgrade and readying the machine for further upgrades at the same time. Operations staff can then upgrade the BIOS, UNIX and memory/hard drive in one pass while servicing each server. MAXIMUS has provided step-by-step instructions to HIO operations staff for this process and operations staff has demonstrated their technical capacity to perform these functions. Though confident in operation staff technical capacity, MAXIMUS has noticed that Y2K tasks are taking much longer than anticipated or even necessary. MAXIMUS is concerned that without technical assistance to manage this process, the HIO – though technically qualified to perform the tasks – will be pulled by various other priorities and not complete these critical items by the close of 1999. MAXIMUS is also particularly concerned about the HIO performing the simulation Y2K test without appropriate technical assistance.